

To our customers,

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## Old Company Name in Catalogs and Other Documents

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

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SH7706 E10A  
Emulation Memory Board  
(HS7706EJH01H)  
User's Manual

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## READ FIRST

- **READ** this user's manual before using this emulation memory board.
- **KEEP** the user's manual handy for future reference.

**Do not attempt to use the emulation memory board until you fully understand its mechanism.**

### **Emulation Memory Board:**

Throughout this document, the term "emulation memory board" shall be defined as the following products produced only by Hitachi, Ltd. excluding all subsidiary products.

- Emulation memory board
- Power cables supplied together with this emulation memory board

The user system or a host computer is not included in this definition.

### **Purpose of the Emulation Memory Board:**

This emulation memory board is an optional board for supporting the development of the systems using Hitachi microcomputer SH7706. This emulation memory board must only be used for the above purpose.

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**Figures:**

Some figures in this user's manual may show items different from your actual system.

**Limited Anticipation of Danger:**

Hitachi cannot anticipate every possible circumstance that might involve a potential hazard. The warnings in this user's manual and on the emulation memory board are therefore not all inclusive. Therefore, you must use the emulation memory board safely at your own risk.

# SAFETY PAGE

## READ FIRST

- **READ** this user's manual before using this emulation memory board.
- **KEEP** the user's manual handy for future reference.

Do not attempt to use the emulation memory board until you fully understand its mechanism.

## DEFINITION OF SIGNAL WORDS



This is the safety alert symbol. It is used to alert you to potential personal injury hazards. Obey all safety messages that follow this symbol to avoid possible injury or death.



**DANGER** indicates an imminently hazardous situation which, if not avoided, will result in death or serious injury.



**WARNING** indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury.



**CAUTION** indicates a potentially hazardous situation which, if not avoided, may result in minor or moderate injury.



**CAUTION** used without the safety alert symbol indicates a potentially hazardous situation which, if not avoided, may result in property damage.

**NOTE** emphasizes essential information.

## **WARNING**

**Observe the precautions listed below. Failure to do so will result in a FIRE HAZARD and will damage the user system, the emulation memory board, and the emulator product or will result in PERSONAL INJURY. The USER PROGRAM will be LOST.**

- 1. Do not repair or remodel the emulation memory board by yourself for electric shock prevention and quality assurance.**
- 2. Always switch OFF the emulator product, the emulation memory board, and the user system before connecting or disconnecting any CABLES or JUMPERS.**
- 3. Always switch OFF the emulation memory board and the user system before connecting or disconnecting the IC socket or the user interface connector.**
- 4. When connecting the user interface connector to the IC socket on the user system, ensure that pin 1 on both sides are correctly aligned.**
- 5. Supply power according to the power specifications and do not supply an incorrect power voltage. Use only the provided power cables.**

# Warnings on Emulation Memory Board Usage

Be sure to read and understand the warnings below before using this emulation memory board. Note that these are the main warnings, not a complete list.

## **WARNING**

**Always switch OFF the emulator product, the emulation memory board, and the user system before connecting or disconnecting any CABLES, JUMPERS, or PARTS. Failure to do so will result in a FIRE HAZARD and will damage the emulator product, the emulation memory board, or the user system, or will result in PERSONAL INJURY. The USER PROGRAM will be LOST.**

## **CAUTION**

**Position the emulator product, the emulation memory board, and the user system so that no cable is bent or twisted. A bent or twisted cable will impose stress on the user interface leading to connection or contact failure. Make sure that the emulation memory board is placed in a secure position so that it does not move during use nor impose stress on the user interface.**

# Preface

Thank you for purchasing the SH7706 E10A emulation memory board. The emulation memory board supports the development of systems using Hitachi microcomputer SH7706.

Read this user's manual before using the emulation memory board, and keep the manual handy for future reference.

## **CAUTION**

**READ this user's manual before using the emulation memory board. Incorrect operation or connection will damage the emulation memory board and the user system. The USER PROGRAM will be LOST.**

### **Related Manuals:**

- SH7706 Hardware Manual
- SH7706 E10A Emulator User's Manual

### **Related Hardware:** SH7706 E10A Emulators

- HS7706KCM01H
- HS7706KCM02H
- HS7706KCI01H
- HS7706KCI02H

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# Section 1 Overview

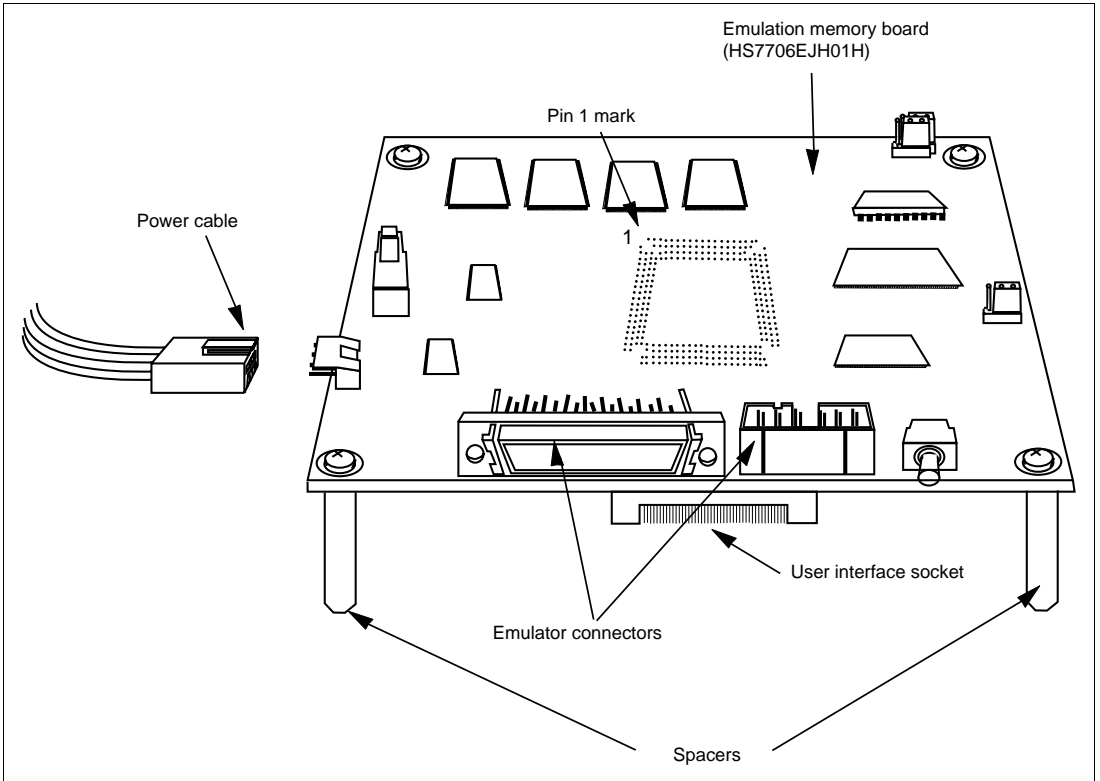
The SH7706 E10A emulation memory board (hereinafter referred to as the emulation memory board) has an SH7706 (hereinafter referred to as the MCU), E10A emulator (hereinafter called the emulator) connectors (H-UDI port connectors), a user interface connector (hereinafter called the user interface), and SRAM devices. User programs can be emulated by connecting this emulation memory board to the emulator.

## 1.1 Features

1. The emulation memory board has emulator connectors (H-UDI port connectors) and a user interface socket (YQPACK176SD). When the user system has a user interface socket (NQPACK176SD) but has no H-UDI connector, the user system can be connected to the emulator through the emulation memory board and the user program can be emulated.
2. The emulation memory board has SRAM devices that can be used as a substitute for the flash memory or EPROM devices. User programs can be emulated by connecting the emulation memory board to the emulator and supplying external power to the emulation memory board, even when no user system is connected to the emulator.
3. The emulation memory board has switches for various settings. These switches can select  
(1) the source of the power supplied to the emulation memory board,  
(2) the source of the clock supplied to the MCU on the emulation memory board, and  
(3) the destination of the CS0 signal output from the MCU.
4. The emulation memory board has a DIP switch, which can set the MCU's MD pin status.

## 1.2 Components

Figure 1.1 and table 1.1 show the components of the emulation memory board. Please make sure you have all of these components when unpacking.



**Figure 1.1 Emulation Memory Board Appearance**



**Table 1.1 Emulation Memory Board Components (HS7706EJH01H)**

<b>Item</b>	<b>Quantity</b>	<b>Notes</b>
Emulation memory board	1	
Power cables (2 cables for 5 V and 2 cables for GND)	1 set	For an external power supply
Screws (M2 x 10 mm)	4	For fastening user interface socket
NQPACK176SD	1	User interface socket
Guide pins for NQPACK176SD	3	Provided for NQPACK176SD
Screwdriver	1	Provided for NQPACK176SD
Spacers (13 mm)	4	Fixed to the emulation memory board
SH7706 E10A Emulation Memory Board User's Manual	1	This manual

### **CAUTION**

**READ the following warnings before using the emulation memory board. Incorrect operation will damage the emulation memory board, the user system, and the emulator product. The USER PROGRAM will be LOST.**

1. Cover the emulation memory board with a casing before using it. If using the emulation memory board without a casing, do not touch any component and prevent any short circuit.
2. Never place heavy objects on the emulation memory board.
3. Protect the emulation memory board from excessive impacts and stresses.
4. Do not supply power outside the specified voltage range.
5. When moving the emulation memory board, take care not to vibrate or damage it.
6. Supply power to the connected equipment only after connecting all cables. Cables must not be connected or removed while the power is on.
7. The emulation memory board may operate incorrectly due to static electricity. In this case, connect the GND patterns (the spacer-fixed sections at the four corners) on the emulation memory board to those of the user system through cables to discharge static electricity.
8. The emulation memory board can operate only when connected to the emulator; the emulation memory board cannot be used alone or only by connecting to the user system.

## Section 3 Emulation Memory Board Functions

The functions of the emulation memory board are listed in table 3.1.

**Table 3.1 Emulation Memory Board Functions**

Function	Specifications
Clock	<ul style="list-style-type: none"><li>• <math>f_{\phi}</math> (CPU clock) = 133.34 MHz (max.)</li><li>• Clock installed in this emulation memory board: 16.6 MHz (EXTAL input)</li></ul>
Substitution emulation memory	<ul style="list-style-type: none"><li>• Capacity: 4 Mbytes (8 blocks of 256 kwords x 16 bits)</li><li>• 66.6 MHz (max.) = B (bus clock): Two wait cycles inserted by WCR2</li><li>• Can be allocated to the CS0 area (Substitution memory area: H'00000000 to H'003FFFFFF)</li><li>• Data bus width can be selected from 16 or 32 bits (8-bit width is not supported)</li></ul>
User interface	Supported package: 176-pin QFP
Crystal oscillator	Supported frequency for crystal oscillation: 10 MHz to 16.7 MHz
Switch settings	<ul style="list-style-type: none"><li>• SW3: Selects the power source</li><li>• JP1 and JP3: Select the clock source</li><li>• JP4: Selects the CS0 signal output destination</li></ul>
DIP switch settings	<ul style="list-style-type: none"><li>• SW2-1 to SW2-3: Selects the clock operating mode</li><li>• SW2-4 and SW2-5: Select the bus width for area 0</li><li>• SW2-6: Selects the endian</li><li>• SW2-7: Selects the ASE mode</li><li>• SW2-8: Selects the source of MD0 to MD5</li><li>• SW2-9: Selects whether or not to write-protect the substitution emulation memory</li></ul>
RESET switch	SW1: Issues a RESET signal
LEDs	<ul style="list-style-type: none"><li>• LED1: RESET and POWER</li><li>• LED2: WAIT and RUN</li><li>• LED3: BREQ and NMI</li><li>• LED4: STATUS1 and STATUS0</li></ul>

**Table 3.1 Emulation Memory Board Functions (cont)**

<b>Function</b>	<b>Specifications</b>
Power supply	<ul style="list-style-type: none"><li>• The emulation memory board can operate without connecting the user system by supplying +5 V through power connector J1 (IL-4P-S3FP2: manufactured by Japan Aviation Electronics Industry, Ltd.) The power connector pins work as follows:<ul style="list-style-type: none"><li>Pin 1: GND (black)</li><li>Pin 2: 5 V (red )</li><li>Pin 3: 5 V (red)</li><li>Pin 4: GND (black)</li></ul></li><li>• When the emulation memory board is connected to the user system, supply +3.3 V from the VccQ pin on the YQPACK176SD socket, respectively.</li></ul>

- Notes:**
1. For the substitution emulation memory, a 16-bit bus and a 32-bit bus are supported. Do not set the bus width to 8 bits when using the substitution emulation memory.
  2. When allocating substitution emulation memory to an area, set WCR2 of the bus state controller to provide an appropriate cycle access state.

## **CAUTION**

### **Restriction on Buffer Control Using the RD Signal:**

**RD signal output cannot be disabled from the emulator. Consequently, when the buffer control on the user system uses only the RD signal, data read from this emulation memory board and data output from the buffer may conflict. For this reason, when using the emulation memory board, be sure to control the data bus buffer of the user system with both the CS and RD (used in direction control) signals.**

# Section 4 Emulation Memory Board Operation

The emulation memory board has a RESET switch (SW1) for issuing a reset signal, a DIP switch (SW2) and jumper switches (JP1, JP3, and JP4) for various settings, a switch (SW3) for selecting the power source, a socket (SP1) for installing a crystal oscillator, and LEDs for signal monitoring. Figure 4.1 shows the switches, socket (SP1), and LEDs.

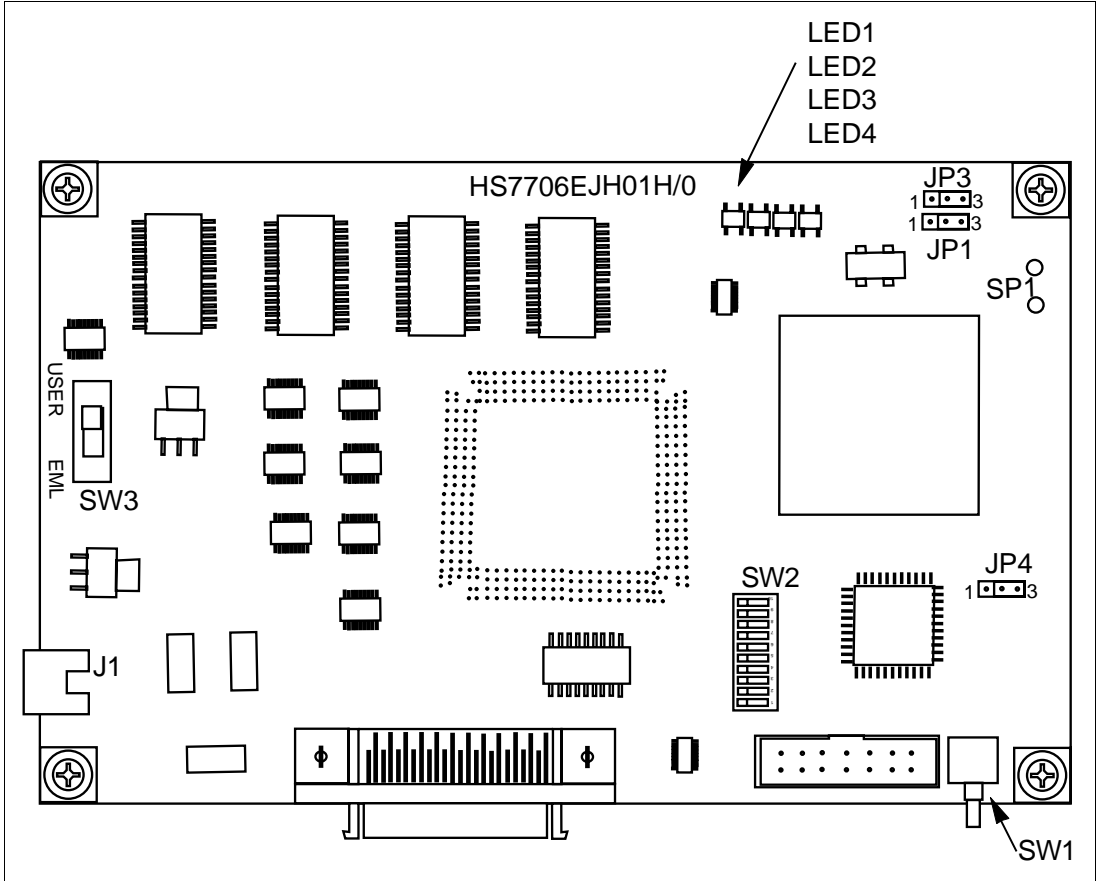


Figure 4.1 Switches, Socket, and LEDs

## 4.1 Switch Setting

### 4.1.1 Power Source Switch Setting

The SW3 selects whether the power for the emulation memory board is supplied from an external source or through the user interface.

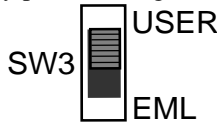
# WARNING

**Always switch OFF the user system and the emulation memory board before power source switch (SW3) setting. Failure to do so will damage the user system and the emulation memory board.**

To supply power from an external source (sliding the switch to EML):



To supply power through the user interface (sliding the switch to USER):

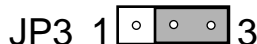


### 4.1.2 Jumper Switch Setting

The emulation memory board has three jumper switches JP1, JP3, and JP4 for the following settings.

**JP1 and JP3 Functions:** The JP1 and JP3 select whether the clock for the MCU is supplied from the emulation memory board or from the user system, or a crystal oscillator is installed into the socket (SP1) on the emulation memory board.

To supply the clock from the emulation memory board (JP1: pins 1-2 closed, JP3: pins 2-3 closed):



To supply the clock from the user system (JP1: pins 1-2 closed, JP3: pins 1-2 closed):



To install a crystal oscillator into the SP1 socket on the emulation memory board (JP1: pins 2-3 closed, JP3: opened):



**Note:** The emulation memory board supports the external clock input through the **EXTAL** pin and the clock generated by the crystal oscillator installed on the SP1 socket. Therefore, be sure to supply the clock to the **EXTAL** pin when using the user system clock. If the clock is supplied to the **XTAL** pin, the emulation memory board cannot operate.

**JP4 Function:** The JP4 selects the CS0 signal output destination to specify whether the memory on the emulation memory board or on the user system is used.

## CAUTION

- 1. Restriction on Buffer Control Using the RD Signal:**  
RD signal output cannot be disabled from the emulator. Consequently, when the buffer control on the user system uses only the RD signal, data read from this emulation memory board and data output from the buffer may conflict. For this reason, when using the emulation memory board, be sure to control the data bus buffer of the user system with both the CS and RD (used in direction control) signals.
- 2. The substitution emulation memory is allocated to the 4 Mbytes from the start address of area 0. If the memory of the user system is allocated to area 0, that is, the same area as the substitution emulation memory, only the memory selected by the JP4 setting is used. When the substitution emulation memory is selected by JP4, the CS0 signal is not output to the user system.**

To use the substitution memory on the emulation memory board (EML side: pins 1-2 closed):



To use the memory of the user system (USER side: pins 2-3 closed):



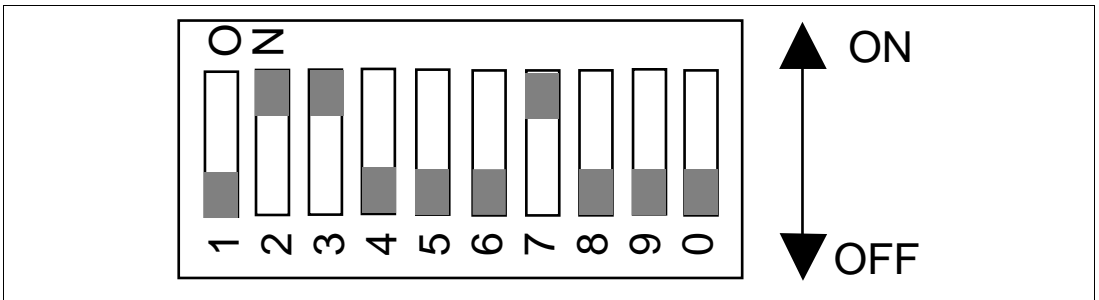
### 4.1.3 DIP Switch (SW2) Setting

The emulation memory board has one DIP switch for the following settings.

- Selecting the clock operating mode: Three switches
- Selecting the memory bus width for area 0: Two switches
- Selecting the endian: One switch
- Selecting the ASE mode: One switch
- Selecting SELECT (input destination of MD0 to MD5): One switch
- Selecting write-protection: One switch

Tables 4.1 to 4.6 show the SW2 functions.

**Note:** For details on the mode control pins (MD0 to MD5), refer to the SH7706 Hardware Manual.



**Figure 4.2 DIP Switch (SW2) Appearance and Settings at Shipment**

**Clock Operating Mode Setting:** Select the clock operating mode as shown in table 4.1.

**Table 4.1 Clock Operating Mode Setting (Switches 1 to 3 in SW2)**

**Switches in SW2 (Corresponding Mode Pins)**

3 (MD2)	2 (MD1)	1 (MD0)	Clock Mode	Remarks
ON	ON	ON	0	
ON	ON	OFF	1	Initial setting at shipment
ON	OFF	ON	2	
OFF	OFF	OFF	7	



**Area 0 Bus Width Setting:** Select the bus width for area 0 as shown in table 4.2.

**Table 4.2 Memory Bus Width Setting (Switches 4 and 5 in SW2)**

**Switches in SW2**

**(Corresponding Mode Pins)**

<b>5 (MD4)</b>	<b>4 (MD3)</b>	<b>Bus Width</b>	<b>Remarks</b>
ON	ON	Reserved	Do not use this setting
ON	OFF	8 bits	Do not use this setting*
OFF	ON	16 bits	
OFF	OFF	32 bits	Initial setting at shipment

Note: The substitution emulation memory does not support the 8-bit bus width.

**Endian Setting:** Select the endian as shown in table 4.3. Big endian is set when the switch is on, and little endian is set when the switch is off.

**Table 4.3 Endian Setting (Switch 6 in SW2)**

**Switch in SW2**

**(Corresponding Mode Pin)**

<b>6 (MD5)</b>	<b>Endian</b>	<b>Remarks</b>
ON	Big endian	
OFF	Little endian	Initial setting at shipment

**ASE Mode Setting:** Select the ASE mode as shown in table 4.4. The ASE mode is set when the switch is on, and the normal mode is set when the switch is off.

**Table 4.4 Chip Mode Setting (Switch 7 in SW2)**

**Switch in SW2**

**(Corresponding Pin)**

<b>7 (ASEMD0)</b>	<b>Chip Mode</b>	<b>Remarks</b>
ON	ASE mode	E10A emulator is used (initial setting at shipment)
OFF	Normal mode	E10A emulator is not used

Note: The emulation memory board is connected to the E10A emulator. Do not change the setting at shipment.

**SELECT (Input Destination of MD0 to MD5) Setting:** Select the input destination of MD control pins (MD0 to MD5) as shown in table 4.5. When the switch is set to ON, settings of MD0 to MD5 input from the user system are valid. When the switch is set to OFF, settings of MD0 to MD5 set by the DIP switch are valid.

**Table 4.5 SELECT Setting (Switch 8 in SW2)**

<b>Switch in SW2 (Corresponding Pin)</b>	<b>Input Destination of MD0 to MD5 to MCU</b>	<b>Remarks</b>
<b>8 (SELECT)</b>		
ON	User system	
OFF	DIP switch	Initial setting at shipment

Note: When the emulation memory board is independently used, set the switch to off.

**Write-Protection Setting:** Select whether to write-protect the substitution emulation memory while the user program is running as shown in table 4.6. When the switch is set to ON, the substitution emulation memory is write-protected. When the switch is set to OFF, the substitution emulation memory can be written to.

**Table 4.6 Write-Protection Setting (Switch 0 in SW2)**

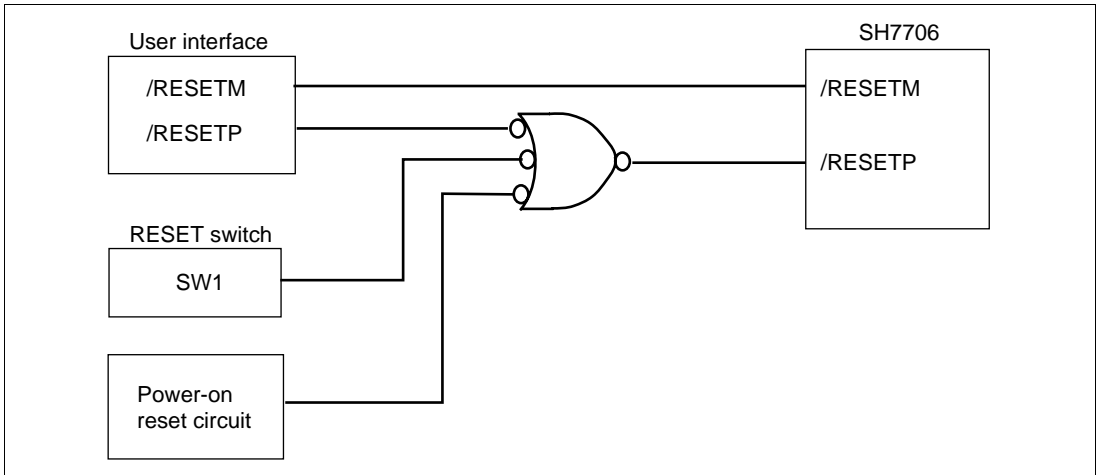
<b>Switch in SW2 (Corresponding Pin)</b>	<b>Write-Protection</b>	<b>Remarks</b>
<b>0 (WP)</b>		
ON	Write-protected	
OFF	Write-enabled	Initial setting at shipment

- Notes:**
- 1. In the following two situations, the substitution emulation memory will not be write-protected even when this switch is set to ON (write-protected): when an E10A emulator break is executed immediately after a write instruction and when step execution is performed.**
  - 2. When JP4 is set to select the USER side (user system memory), the write-protection setting switch (switch 0 in SW2) becomes invalid; the substitution emulation memory is not write-protected even when switch 0 in SW2 is set to ON (write-protected).**

#### 4.1.4 RESET Switch (SW1)

The emulation memory board has RESET switch for issuing a reset signal.

The /RESETP signal to the MCU is obtained by ORing the reset signal from the RESET switch, that from the power-on reset circuit on the emulation memory board, and the /RESETP signal from the user interface. The manual reset, on the other hand, is done using only the /RESETM signal from the user interface. Figure 4.3 shows the logic diagram for the reset circuit.



**Figure 4.3 Reset Circuit Logic Diagram**

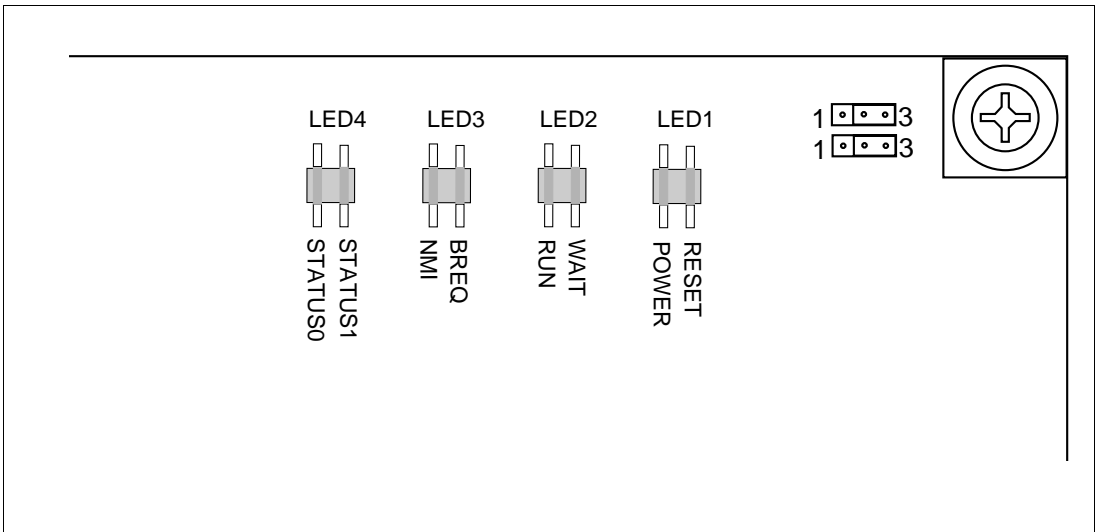
## 4.2 Monitor LEDs

The emulation memory board has LEDs for monitoring the operating state. Table 4.8 shows the LEDs and the states to be monitored.

For details on STATUS1 and STATUS0 signals, refer to the SH7706 Hardware Manual.

**Table 4.8 LEDs and States to Be Monitored**

LED	Indication on the Board	LED Status	Remarks
LED1	RESET	Green LED lit when /RESETP is asserted	
	POWER	Red LED lit when power is supplied	
LED2	WAIT	Green LED lit when /WAIT is asserted	
	RUN	Red LED lit when in USER RUN state	Signal: /ASEBRKAK
LED3	BREQ	Green LED lit when /BREQ is asserted	
	NMI	Red LED lit when /NMI is asserted	
LED4	STATUS1	Green LED lit when STATUS1 is 0 (low)	
	STATUS0	Red LED lit when STATUS0 is 0 (low)	



**Figure 4.4 LED Location and Indication on the Board**

## Section 5 Connection Procedures

### 5.1 Connecting Emulation Memory Board to Emulator and User System

Be sure to switch off the emulator and user system before connecting the emulation memory board, emulator, and user system. Do not supply power to the power pin on the emulation memory board when using the user system.

#### **WARNING**

**Observe the precautions listed below. Failure to do so will result in a FIRE HAZARD and will damage the user system, the emulation memory board, and the emulator product or will result in PERSONAL INJURY. The USER PROGRAM will be LOST.**

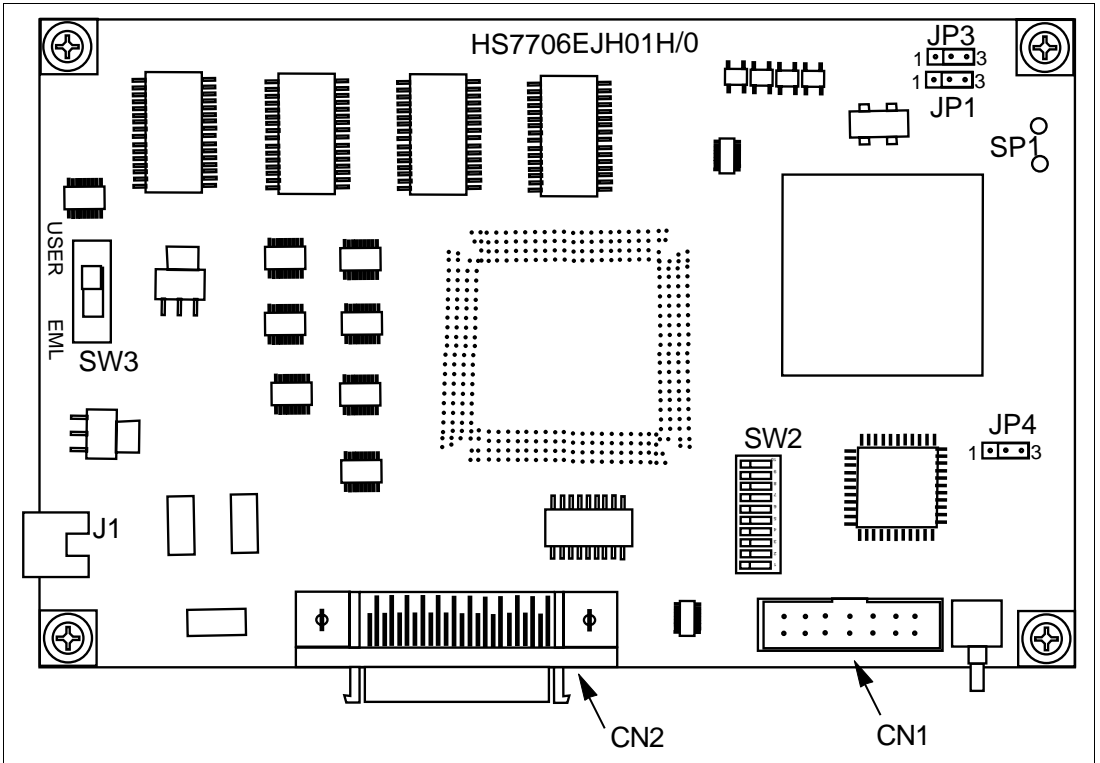
- 1. Always switch OFF the emulator product, the emulation memory board, and the user system before connecting the EMULATOR PRODUCT, EMULATION MEMORY BOARD, or USER SYSTEM.**
- 2. DO NOT supply power to the emulation memory board from power connector (J1) when the emulation memory board is connected to the user system. When connected to the user system, the emulation memory board receives power from the VccQ pin of the user interface (NQPAC176SD) and operates by the user system power.**

**Connecting Emulation Memory Board to Emulator:** Connect the emulator to the 14-pin connector (CN1) or 36-pin connector (CN2) on the emulation memory board, depending on the emulator type as follows:

HS7706KCM01H or HS7706KCI01H: 14-pin connector (CN1)

HS7706KCM02H or HS7706KCI02H: 36-pin connector (CN2)

For details on the connection procedure, refer to the SH7706 E10A Emulator User's Manual.



**Figure 5.1 Connectors for Emulator**

## **WARNING**

**Observe the precautions listed below. Failure to do so will result in a FIRE HAZARD and will damage the user system, the emulation memory board, and the emulator product or will result in PERSONAL INJURY. The USER PROGRAM will be LOST.**

- 1. Always switch OFF the emulator product, the emulation memory board, and the user system before connecting the EMULATOR PRODUCT, EMULATION MEMORY BOARD, or USER SYSTEM.**
- 2. Use the recommended user interface socket on the user system. Otherwise, excessive force will be applied to the emulation memory board and the user system when the emulation memory board is connected to or disconnected from the user system.**

## **CAUTION**

- 1. Use NQPACK176SD (manufactured by Tokyo Eletech Corporation) as the QFP176 socket on the user system.**
- 2. To mount the MCU directly on the NQPACK176SD socket, a socket cover must be used. Separately purchase HQPACK176SD (manufactured by Tokyo Eletech Corporation).**

1. Confirm that the pins of the YQPACK socket on the emulation memory board are not bent.
2. Align pin 1 of the YQPACK socket on the emulation memory board with pin 1 of the NQPACK socket on the user system, and insert the connector into the socket.

## **CAUTION**

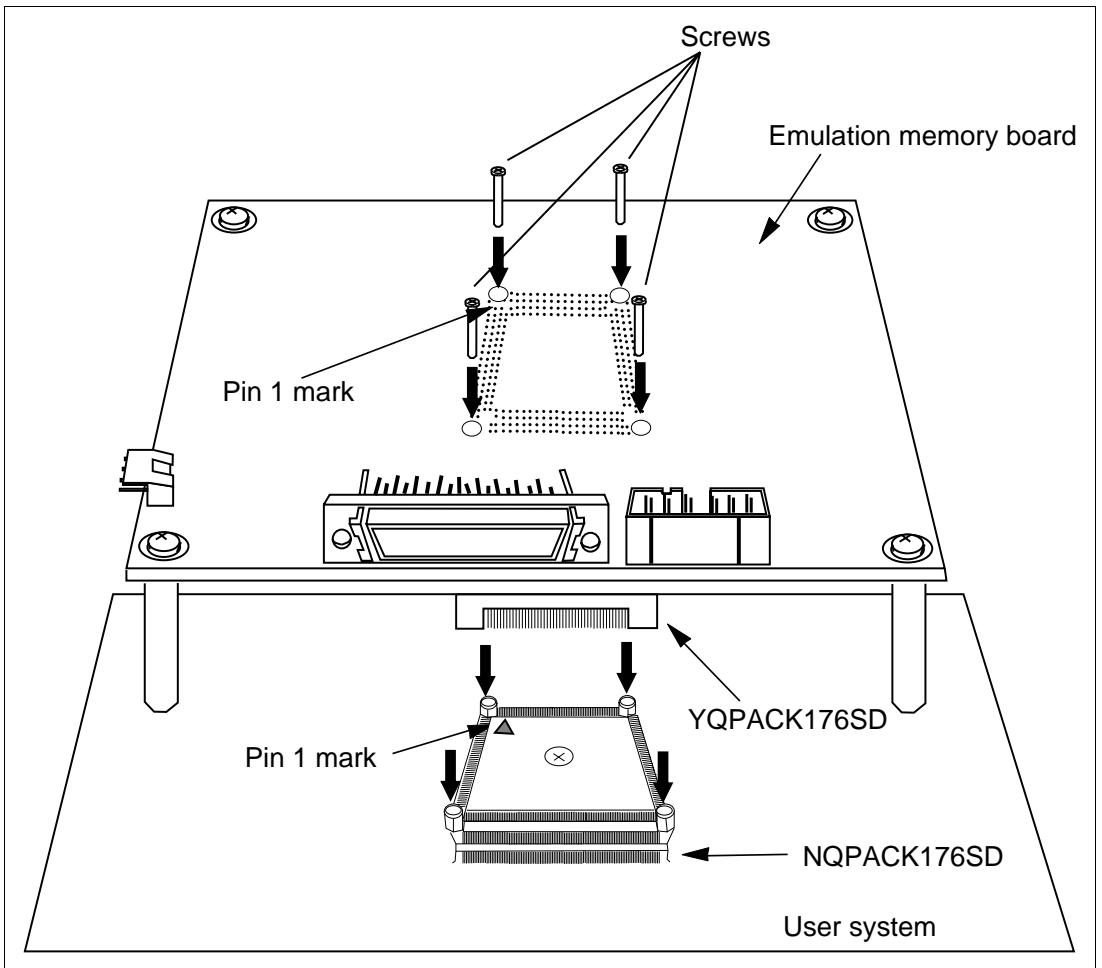
**The structures of the YQPACK and NQPACK sockets prevent the connector from being fully inserted in the wrong direction. If the connector cannot be inserted fully, pin 1 on the connector and that on the socket may not be aligned correctly. If the emulation memory board and the user system are connected with the incorrect alignment of pin 1, they will be damaged by additional forces. Check the pin 1 locations on the connector and socket and re-insert the YQPACK socket.**

3. After inserting the YQPACK socket on the emulation memory board into the NQPACK socket of the user system, fix the emulation memory board in place with the supplied screws, as shown in figure 5.2.

## **CAUTION**

1. **Use the supplied screwdriver.**
2. **The tightening torque must be 0.054 N•m or less. Stop tightening when the force required to turn the screw becomes significantly greater than that needed when first tightening.**
3. **If a screw is tightened too much, the screw head may break or an IC socket contact error may be caused by a crack in the IC socket solder.**
4. **If the emulator does not operate correctly, cracks might have occurred in the solder. Check conduction with a tester and re-solder the IC socket if necessary.**





**Figure 5.2 Connecting Emulation Memory Board to User System**

**Power Supply Specifications:** When the user system is connected, the emulation memory board operates by the user system power. Supply the user system power according to the specifications and rising timing shown in table 5.1 and figure 5.3.

## CAUTION

1. Check that the SW3 switch is set to the power supply through the user interface, and supply 3.3-V power to the VccQ pin. Do not supply power to the power connector (J1) on the emulation memory board.
2. When power is supplied through the user interface (YQPACK), only 3.3-V power should be supplied from the user system, and the emulation memory board generates 1.9-V power from the 3.3-V power. Therefore, the Vcc pin (1.9 V) of the user interface (YQPACK) is not connected to the MCU on the emulation memory board.

Table 5.1 Power Supply Specifications

Allowable Power Range	Current Consumption
+ 3.3 V (DC) $\pm$ 5%	600 mA (max.)

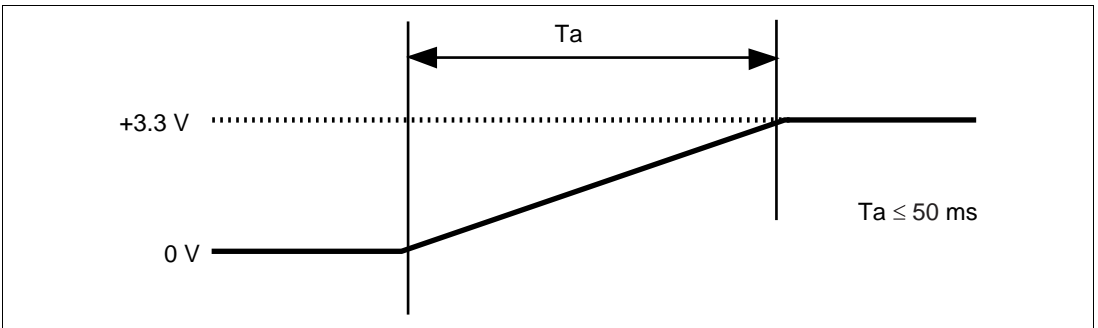


Figure 5.3 Characteristics of DC Rising Timing

## 5.2 Operating Emulation Memory Board Without Connecting User System

Be sure to switch off the emulator and emulation memory board before connecting them together and before connecting the power cables to the emulation memory board.

### **WARNING**

**Always switch OFF the emulator product and the emulation memory board before connecting the EMULATOR PRODUCT, EMULATION MEMORY BOARD, or POWER CABLES. Failure to do so will result in a FIRE HAZARD and will damage the emulator product and the emulation memory board or will result in PERSONAL INJURY.**

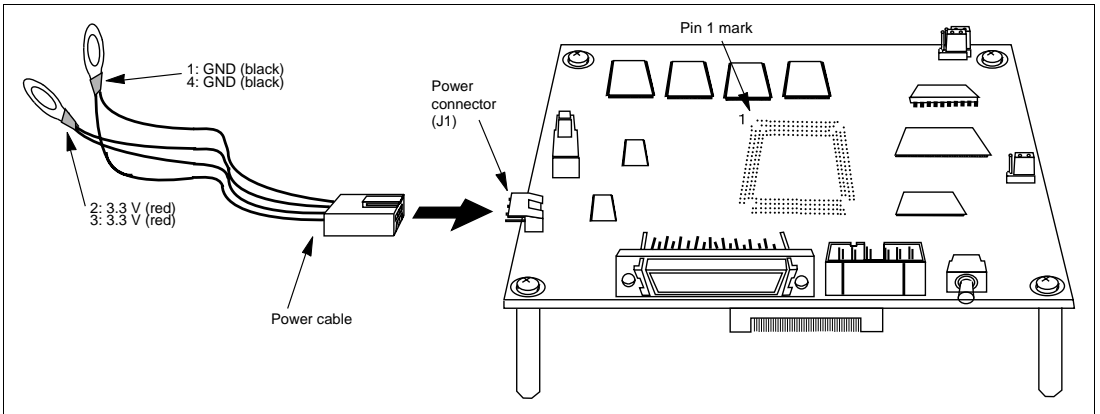
**Connecting to the Emulator:** Connect the emulation memory board to the emulator by using the same procedure as in Connecting Emulation Memory Board to Emulator, described in section 5.1, Connecting Emulation Memory Board to Emulator and User System.

**Connecting the Power Cables:** After making sure the alignment is correct, connect the provided power cables to the power connector (J1) on the emulation memory board to supply power, as shown in figure 5.4. (The power cable and connector structures will prevent the power cables from being connected in the wrong direction.)

Note that the red cables are for 5-V power and the black ones are for GND; connect them to the DC power source correctly.

### **WARNING**

**Be sure to connect the power cables to the DC power source correctly, that is, the red cables to the 5-V power and the black ones to GND. Failure to do so will result in a FIRE HAZARD and will damage the emulator product and the emulation memory board or will result in PERSONAL INJURY.**

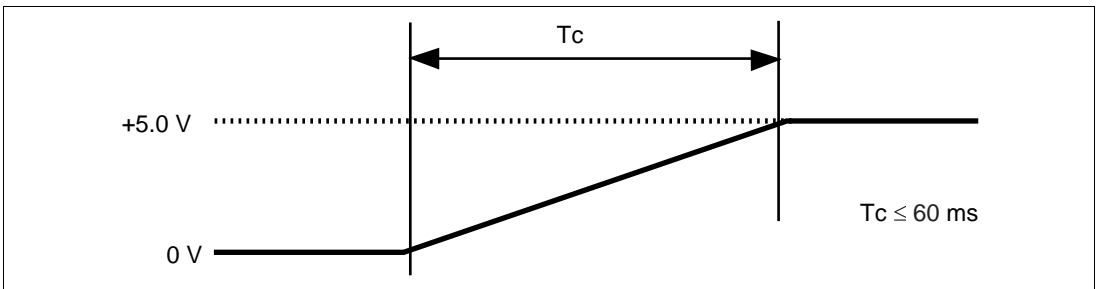


**Figure 5.4 Connecting Power Cables to Power Connector**

**Power Supply Specifications:** Table 5.2 shows the power supply specifications, and figure 5.5 shows the rising timing of the power.

**Table 5.2 Power Supply Specifications**

Allowable Power Range	Current Consumption
+ 5.0 V (DC) $\pm$ 5%	620 mA (max.)



**Figure 5.5 Characteristics of DC Rising Timing**

## 5.3 Disconnecting Emulation Memory Board from User System

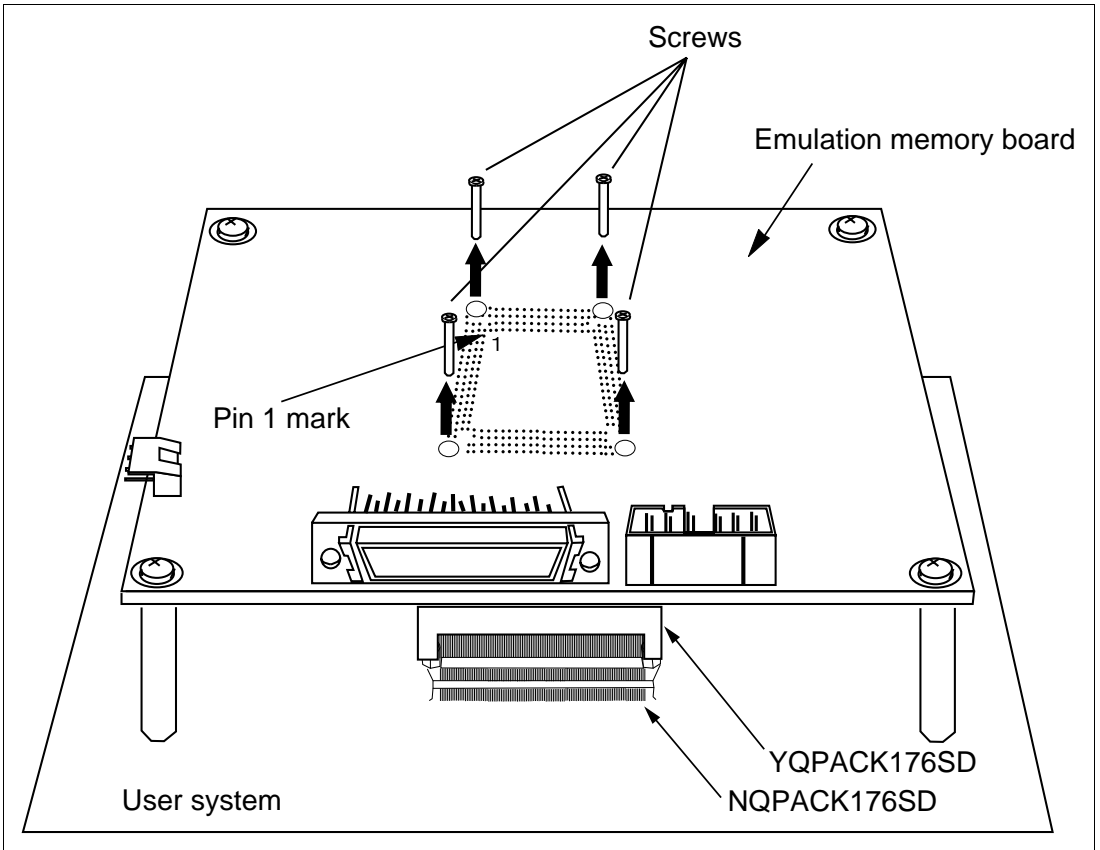
Be sure to switch off the emulator and user system before disconnection.

### **WARNING**

**Always switch OFF the emulator product, the emulation memory board, and the user system before disconnecting the EMULATOR PRODUCT, EMULATION MEMORY BOARD, or USER SYSTEM. Failure to do so will result in a FIRE HAZARD and will damage the emulator product, the emulation memory board, and the user system or will result in PERSONAL INJURY.**

**Disconnecting Emulation Memory Board from User System:** Follow the instructions below.

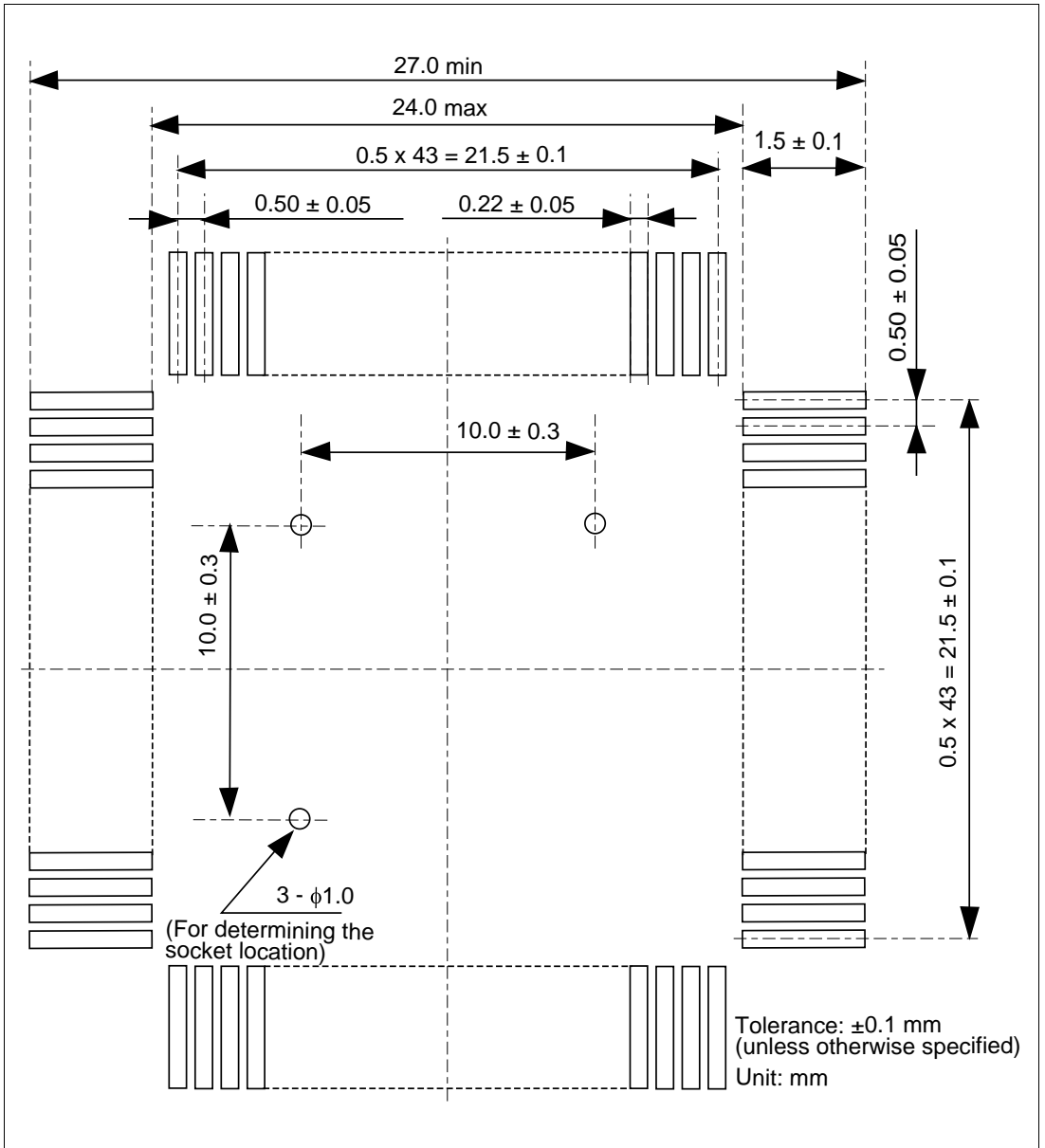
1. Remove the screws that connect the YQPACK and NQPACK sockets.
2. After removing all screws, remove the emulation memory board from the user system, taking care not to bend any of the pins.



**Figure 5.6 Disconnecting Emulation Memory Board**

## 5.4 Recommended Dimensions for User System Mount Pad

Figure 5.7 shows the recommended dimensions for the mount pad (footprint) for the user system with an IC socket for a QFP176 package (NQPACK176SD: manufactured by Tokyo Eletech Corporation). Note that the dimensions in figure 5.7 are somewhat different from those of the actual chip's mount pad.



**Figure 5.7 Recommended Dimensions for Mount Pad**

# Section 6 Limitations

## 6.1 Unavailable Pins

Since the H-UDI is used on the emulation memory board, the following signals that are multiplexed with H-UDI signals cannot be used:

(1) When using the 36-pin connector (CN2):

PTG[0], PTG[1], PTG[2], PTG[3], PTG[4], PTF[0], PTF[1], PTF[2], PTF[3], PTF[4], PTF[5], PTF[6]

(2) When using the 14-pin connector (CN1):

PTG[0], PTG[1], PTG[2], PTG[3], PTG[5], PTG[6]

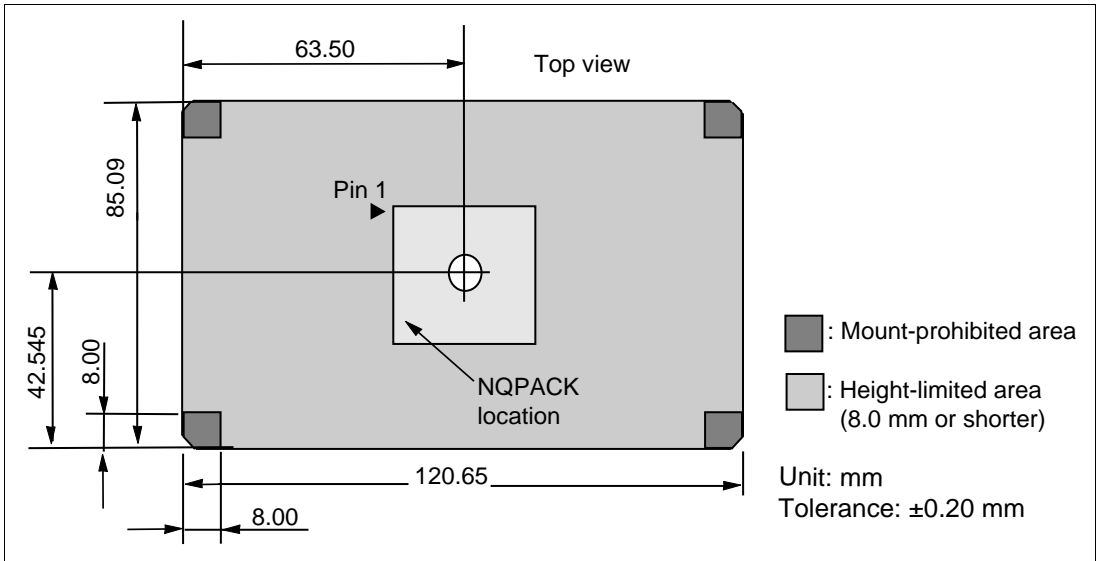
Note: When the 14-pin connector (CN1) is used, PTF[0], PTF[1], PTF[2], PTF[3], PTF[4], and PTG[4] can be used. However, pull up or do not connect these signals in the user system side to avoid affection by the user system.

## 6.2 Limitations on Connecting the User System

To use the emulation memory board together with the user system, do not mount any components in the mount-prohibited areas (figure 6.1) of the user system. If any component is mounted on any of these areas, remove the corresponding spacer from the emulation memory board. In this case, take special care not to give any stress to the user interface section (NQPACK).

The height of the mounted components must be 8.0 mm or shorter in the height-limited area (figure 6.1) of the user system. If any component in this area is higher than 8.0 mm, the emulation memory board cannot be connected to the user system.





**Figure 6.1 Mount-Prohibited and Height-Limited Areas of User System**

# Section 7 User Interface

## 7.1 Pin Assignment and Handling of User Interface Signals

The emulation memory board has a socket (YQPACK) for user interface. Table 7.1 shows the pin assignment of the user interface and signal handling on the emulation memory board.

**Table 7.1 Pin Assignment and Handling of User Interface**

No.	Signal Name	Handling	Notes	No.	Signal Name	Handling	Notes
1	Vcc_RTC	NC		26	D15		
2	XTAL2	NC		27	VccQ	3.3 V	
3	EXTAL2	NC		28	D14		
4	Vss_RTC	NC		29	D13		
5	D31/PTB7			30	D12		
6	D30/PTB6			31	D11		
7	D29/PTB5			32	D10		
8	D28/PTB4			33	D9		
9	D27/PTB3			34	D8		
10	D26/PTB2			35	D7		
11	VssQ	GND		36	D6		
12	D25/PTB1			37	VssQ	GND	
13	VccQ	3.3 V		38	D5		
14	D24/PTB0			39	VccQ	3.3 V	
15	D23/PTA7			40	D4		
16	D22/PTA6			41	D3		
17	D21/PTA5			42	D2		
18	D20/PTA4			43	D1		
19	Vss	GND		44	D0		
20	D19/PTA3			45	A0		
21	Vcc	NC		46	A1		
22	D18/PTA2			47	A2		
23	D17/PTA1			48	A3		
24	D16/PTA0			49	VssQ	GND	
25	VssQ	GND		50	A4		

**Table 7.1 Pin Assignment and Handling of User Interface (cont)**

No.	Signal Name	Handling	Notes	No.	Signal Name	Handling	Notes
51	VccQ	3.3 V		81	WE2/DQMUL/ ICIORD/PTC1		47 kΩ
52	A5			82	WE3/DQMUI/ ICIOWR/PTC2		47 kΩ
53	A6			83	RDWR		
54	A7			84	VssQ	GND	
55	A8			85	CS0		
56	A9			86	VccQ	NC	
57	A10			87	CS2/PTC3		47 kΩ
58	A11			88	CS3/PTC4		47 kΩ
59	A12			89	CS4/PTC5		47 kΩ
60	A13			90	CS5/CE1A/PTC6		47 kΩ
61	VssQ			91	CS6/CE1B/PTC7		47 kΩ
62	A14	GND		92	CE2A/PTD6		47 kΩ
63	VccQ			93	VssQ		
64	A15	3.3 V		94	CE2B/PTD7		47 kΩ
65	A16			95	VccQ		
66	A17			96	RASL/PTD0		47 kΩ
67	A18			97	RASU/PTD1		47 kΩ
68	A19			98	CASL/PTD2		47 kΩ
69	A20			99	CASU/PTD3		47 kΩ
70	A21			100	CKE/PTD4		47 kΩ
71	VSS			101	IOIS16/PTD5	Pull-up	47 kΩ
72	A22			102	BACK		
73	VCC			103	BREQ	Pull-up	47 kΩ
74	A23	GND		104	WAIT	Pull-up	47 kΩ
75	A24			105	DACK0/PTE0	Pull-up	47 kΩ
76	A25	3.3 V		106	DACK1/PTE1	Pull-up	47 kΩ
77	BS/PTC0			107	DRAK0/PTE2	Pull-up	47 kΩ
78	RD			108	DRAK1/PTE3	Pull-up	47 kΩ
79	WE0/DQMLL			109	AUDATA0/PTF0	Pull-up	
80	WE1/DQMLU/WE			110	AUDATA1/PTF1	Pull-up	

**Table 7.1 Pin Assignment and Handling of User Interface (cont)**

No.	Signal Name	Handling	Notes	No.	Signal Name	Handling	Notes
111	AUDATA2/PTF2	Pull-up		132	EXTAL		
112	AUDATA3/PTF3	Pull-up		133	STATUS0/PTE4	Pull-up	47 kΩ
113	AUDSYNC/PTF4	Pull-up		134	STATUS1/PTE5	Pull-up	47 kΩ
114	TDI/PTG0	NC	Cannot be used	135	TCLK/PTE6	Pull-up	47 kΩ
115	Vss	GND		136	IRQOUT/PTE7	Pull-up	47 kΩ
116	TCK/PTG1	NC	Cannot be used	137	VSSQ	GND	
117	Vcc	NC		138	CKIO		
118	TMS/PTG2	NC	Cannot be used	139	VCCQ	3.3 V	
119	TRST/PTG3	NC	Cannot be used	140	TXD0/SCPT0		
120	TDO/PTF5	NC	Cannot be used	141	SCK0/SCPT1	Pull-up	47 kΩ
121	ASEBRKAK/PTF6	NC	Cannot be used	142	TXD2/SCPT2		
122	ASEMD0	NC	Cannot be used	143	SCK2/SCPT3	Pull-up	47 kΩ
123	Vcc_PLL1	NC		144	RTS2/SCPT4	Pull-up	47 kΩ
124	CAP1	NC		145	RXD0/SCPT0	Pull-up	47 kΩ
125	Vss_PLL1	NC		146	RXD2/SCPT2	Pull-up	47 kΩ
126	Vss_PLL2	NC		147	CTS2/IRQ5/SCPT5	Pull-up	47 kΩ
127	CAP2	NC		148	Vss	GND	
128	Vcc_PLL2	NC		149	RESETM	Pull-up	47 kΩ
129	MD1	Pull-up	47 kΩ	150	Vcc	NC	
130	Vss	GND		151	IRQ0/IRL0/PTH0	Pull-up	47 kΩ
131	XTAL	NC		152	IRQ1/IRL1/PTH1	Pull-up	47 kΩ

**Table 7.1 Pin Assignment and Handling of User Interface (cont)**

No.	Signal Name	Handling	Notes	No.	Signal Name	Handling	Notes
153	IRQ2/IRL2/PTH2	Pull-up	47 kΩ	165	RESETP	Pull-up	47 kΩ
154	IRQ3/IRL3/PTH3	Pull-up	47 kΩ	166	CA	Pull-up	47 kΩ
155	IRQ4/PTH4	Pull-up	47 kΩ	167	MD3	Pull-up	47 kΩ
156	VssQ	GND		168	MD4	Pull-up	47 kΩ
157	NMI	Pull-up	47 kΩ	169	MD5	Pull-up	47 kΩ
158	VccQ	3.3 V		170	AVss	GND	
159	AUDCK/PTG4	Pull-up		171	AN0/PTJ0		
160	DREQ0/PTH5	Pull-up	47 kΩ	172	AN1/PTJ1		
161	DREQ1/PTH6	Pull-up	47 kΩ	173	AN2/DA1/PTJ2		
162	ADTRG/PTG6	Pull-up	47 kΩ	174	AN3/DA2/PTJ3		
163	MD0	Pull-up	47 kΩ	175	Avcc	3.3 V	
164	MD2	Pull-up	47 kΩ	176	Avss	GND	

## CAUTION

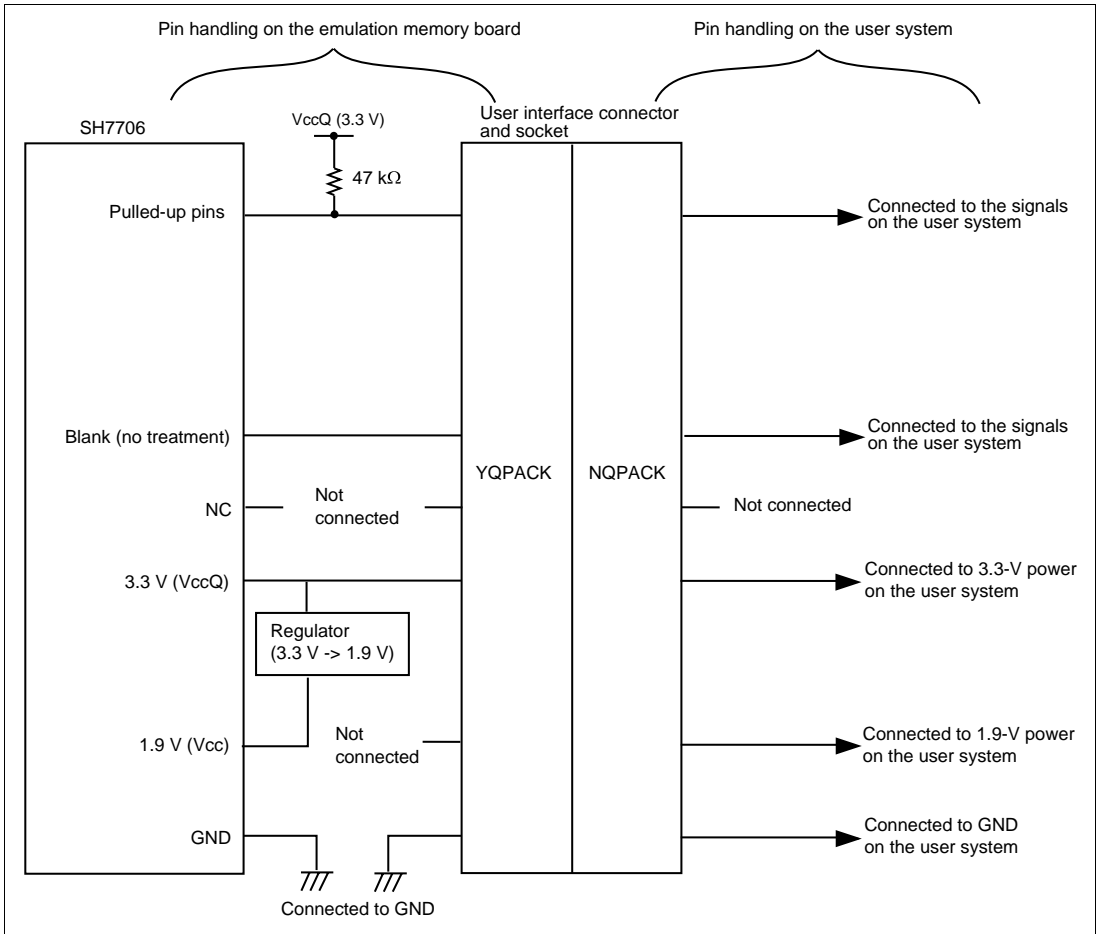
**When power is supplied through the user interface (YQPACK), only 3.3-V power should be supplied from the user system, and the emulation memory board generates 1.9-V power from the 3.3-V power. Therefore, the Vcc pin (1.9 V) of the user interface (YQPACK) is not connected to the MCU on the emulation memory board.**

### Handling:

- Pull-up: The pin is pulled up to 3.3 V through a 47-kΩ resistor on the board.
- 3.3 V: 3.3 V is supplied from the user system (when sliding SW3 to USER).
- GND: The pin is connected to GND on the board.
- NC: The MCU pin is not connected to the user interface.
- Blank: The MCU pin is directly connected to the user interface.

## 7.2 Pin Handling on the Emulation Memory Board and User System

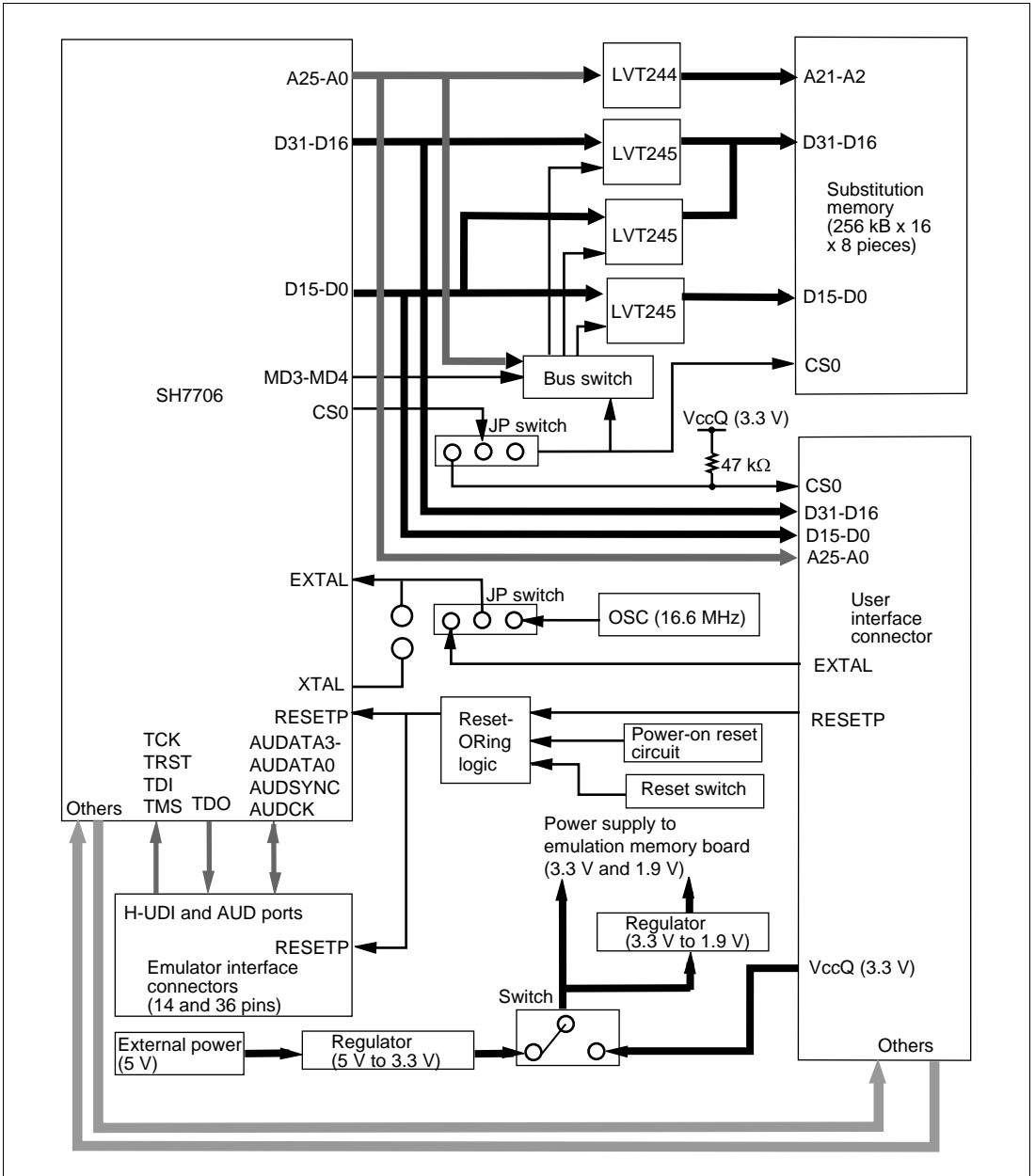
The emulation memory board is connected to the user system through the user interfaces (YQPACK and NQPACK). Figure 7.1 shows the signal line handling on the emulation memory board and the user system.



**Figure 7.1** Signal Line Handling on the Emulation Memory Board and User System

## Section 8 Emulation Memory Board Block Diagram

The emulation memory board has an MCU (SH7706), a user interface, emulator connectors, and memory. Figure 8.1 shows the block diagram of the emulation memory board.

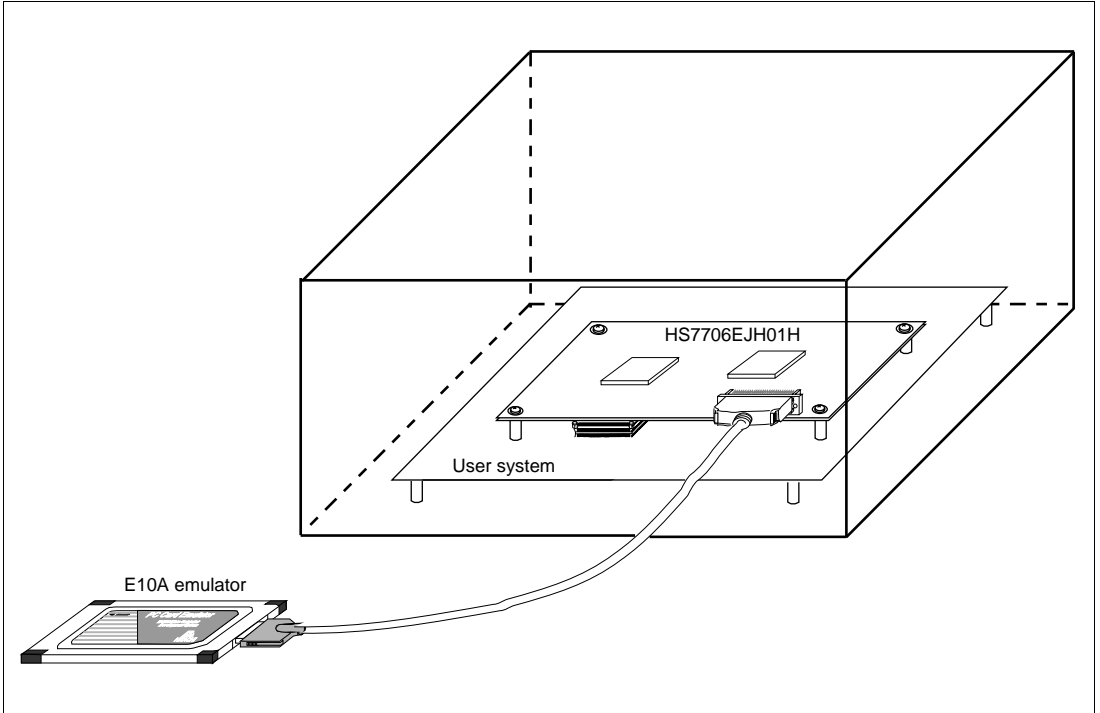


**Figure 8.1 Emulation Memory Board Block Diagram**



## Section 9 Using the Emulator in a Case

Package the emulator and the emulation memory board in a case as shown below. The recommended material of the case to prevent electrical magnetic interference (EMI) noise is iron plated with nickel or resin plated with nickel inside. The case must have enough size to hold the emulation memory board and the user system.



**Figure 9.1 Configuration for Countermeasure against EMI Noise**

Note: EMI stands for Electrical Magnetic Interference.