

To our customers,

Old Company Name in Catalogs and Other Documents

On April 1st, 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 1st, 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.

SH7144 Group FP-112B
User System Interface Board
HS7144ECH61H User's Manual
Renesas Microcomputer
Development Environment
System
SuperH™ Family/SH7144 Series

Cautions

Keep safety first in your circuit designs!

1. Renesas Technology Corp. puts the maximum effort into making semiconductor products better and more reliable, but there is always the possibility that trouble may occur with them. Trouble with semiconductors may lead to personal injury, fire or property damage. Remember to give due consideration to safety when making your circuit designs, with appropriate measures such as (i) placement of substitutive, auxiliary circuits, (ii) use of nonflammable material or (iii) prevention against any malfunction or mishap.

Notes regarding these materials

1. These materials are intended as a reference to assist our customers in the selection of the Renesas Technology Corp. product best suited to the customer's application; they do not convey any license under any intellectual property rights, or any other rights, belonging to Renesas Technology Corp. or a third party.
2. Renesas Technology Corp. assumes no responsibility for any damage, or infringement of any third-party's rights, originating in the use of any product data, diagrams, charts, programs, algorithms, or circuit application examples contained in these materials.
3. All information contained in these materials, including product data, diagrams, charts, programs and algorithms represents information on products at the time of publication of these materials, and are subject to change by Renesas Technology Corp. without notice due to product improvements or other reasons. It is therefore recommended that customers contact Renesas Technology Corp. or an authorized Renesas Technology Corp. product distributor for the latest product information before purchasing a product listed herein. The information described here may contain technical inaccuracies or typographical errors. Renesas Technology Corp. assumes no responsibility for any damage, liability, or other loss rising from these inaccuracies or errors. Please also pay attention to information published by Renesas Technology Corp. by various means, including the Renesas Technology Corp. Semiconductor home page (<http://www.renesas.com>).
4. When using any or all of the information contained in these materials, including product data, diagrams, charts, programs, and algorithms, please be sure to evaluate all information as a total system before making a final decision on the applicability of the information and products. Renesas Technology Corp. assumes no responsibility for any damage, liability or other loss resulting from the information contained herein.
5. Renesas Technology Corp. semiconductors are not designed or manufactured for use in a device or system that is used under circumstances in which human life is potentially at stake. Please contact Renesas Technology Corp. or an authorized Renesas Technology Corp. product distributor when considering the use of a product contained herein for any specific purposes, such as apparatus or systems for transportation, vehicular, medical, aerospace, nuclear, or undersea repeater use.
6. The prior written approval of Renesas Technology Corp. is necessary to reprint or reproduce in whole or in part these materials.
7. If these products or technologies are subject to the Japanese export control restrictions, they must be exported under a license from the Japanese government and cannot be imported into a country other than the approved destination. Any diversion or reexport contrary to the export control laws and regulations of Japan and/or the country of destination is prohibited.
8. Please contact Renesas Technology Corp. for further details on these materials or the products contained therein.

IMPORTANT INFORMATION

READ FIRST

- **READ this user's manual before using this user system interface cable.**
- **KEEP the user's manual handy for future reference.**

Do not attempt to use the user system interface cable until you fully understand its mechanism.

User System Interface Cable:

Throughout this document, the term "user system interface cable" shall be defined as the following product produced only by Renesas Technology Corp. excluding all subsidiary products.

- User system interface cable (HS7144ECH61H)

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

Purpose of the User System Interface Cable:

This user system interface cable is for connecting the evaluation chip board and user system. This user system interface cable must only be used for the above purpose.

Improvement Policy:

Renesas Technology Corp. (including its subsidiaries, hereafter collectively referred to as Renesas) pursues a policy of continuing improvement in design, performance, functions, and safety of the user system interface cable. Renesas reserves the right to change, wholly or partially, the specifications, design, user's manual, and other documentation at any time without notice.

Target User of the User System Interface Cable:

This user system interface cable should only be used by those who have carefully read and thoroughly understood the information and restrictions contained in the user's manual. Do not attempt to use the user system interface cable until you fully understand its mechanism.

It is highly recommended that first-time users be instructed by users that are well versed in the operation of the user system interface cable.

LIMITED WARRANTY

Renesas warrants its user system interface cables to be manufactured in accordance with published specifications and free from defects in material and/or workmanship. Renesas will repair or replace any user system interface cables determined to be defective in material and/or workmanship. User system interface cables are wearing parts which Renesas will not repair or replace if damaged and/or worn through use. The foregoing shall constitute the sole remedy for any breach of Renesas' warranty. This warranty extends only to you, the original Purchaser. It is not transferable to anyone who subsequently purchases the user system interface cable from you. Renesas is not liable for any claim made by a third party or made by you for a third party.

DISCLAIMER

RENESAS MAKES NO WARRANTIES, EITHER EXPRESS OR IMPLIED, ORAL OR WRITTEN, EXCEPT AS PROVIDED HEREIN, INCLUDING WITHOUT LIMITATION THEREOF, WARRANTIES AS TO MARKETABILITY, MERCHANTABILITY, FITNESS FOR ANY PARTICULAR PURPOSE OR USE, OR AGAINST INFRINGEMENT OF ANY PATENT. IN NO EVENT SHALL RENESAS BE LIABLE FOR ANY DIRECT, INCIDENTAL OR CONSEQUENTIAL DAMAGES OF ANY NATURE, OR LOSSES OR EXPENSES RESULTING FROM ANY DEFECTIVE USER SYSTEM INTERFACE CABLE, THE USE OF ANY USER SYSTEM INTERFACE CABLE, OR ITS DOCUMENTATION, EVEN IF ADVISED OF THE POSSIBILITY OF SUCH DAMAGES. EXCEPT AS EXPRESSLY STATED OTHERWISE IN THIS WARRANTY, THIS USER SYSTEM INTERFACE CABLE IS SOLD "AS IS", AND YOU MUST ASSUME ALL RISK FOR THE USE AND RESULTS OBTAINED FROM THE USER SYSTEM INTERFACE CABLE.

State Law:

Some states do not allow the exclusion or limitation of implied warranties or liability for incidental or consequential damages, so the above limitation or exclusion may not apply to you. This warranty gives you specific legal rights, and you may have other rights which may vary from state to state.

The Warranty is Void in the Following Cases:

Renesas shall have no liability or legal responsibility for any problems caused by misuse, abuse, misapplication, neglect, improper handling, installation, repair or modifications of the user system interface cable without Renesas' prior written consent or any problems caused by the user system.

All Rights Reserved:

This user's manual and user system interface cable are copyrighted and all rights are reserved by Renesas. No part of this user's manual, all or part, may be reproduced or duplicated in any form, in hard-copy or machine-readable form, by any means available without Renesas' prior written consent.

Other Important Things to Keep in Mind:

1. Circuitry and other examples described herein are meant merely to indicate the characteristics and performance of Renesas' semiconductor products. Renesas assumes no responsibility for any intellectual property claims or other problems that may result from applications based on the examples described herein.
2. No license is granted by implication or otherwise under any patents or other rights of any third party or Renesas.

Figures:

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

Limited Anticipation of Danger:

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

SAFETY PAGE

READ FIRST

- **READ** this user's manual before using this user system interface cable.
- **KEEP** the user's manual handy for future reference.

Do not attempt to use the user system interface cable 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 and the emulator product or will result in PERSONAL INJURY. The USER PROGRAM will be LOST.

- 1. Do not repair or remodel the emulator product by yourself for electric shock prevention and quality assurance.**
- 2. Always switch OFF the E6000H emulator and user system before connecting or disconnecting any CABLES or PARTS.**
- 3. Always before connecting any CABLES, make sure that pin 1 on both sides are correctly aligned.**

Preface

The HS7144ECH61H is a user system interface board that connects a user system for the SH7144 FP-112B package to the SH7046 E6000H emulator (HS7046EPH60H).

Contents

Section 1	Configuration.....	1
Section 2	Environmental Conditions.....	3
2.1	Setting Operating Voltage and Operating Frequency	3
Section 3	Product Specifications	4
	Drop in Vcc Level Detection Function:	4
Section 4	User Interface Specifications.....	5
4.1	User System Interface Circuit	5
Section 5	Connection Procedures	7
5.1	Connecting User System Interface Board to User System	7
5.1.1	Installing IC Socket.....	7
5.1.2	Installing Cable Head.....	8
5.1.3	Fastening Cable Head	8
5.2	Connecting User System Interface Board to EV-Chip Board	10
5.3	Recommended Dimensions for User System Mount Pad (Footprint)	12
5.4	Dimensions for EV-Chip Board and User System Interface Board.....	13
5.5	Resulting Dimensions after Connecting User System Interface Board	14
Section 6	Installing the MCU to the User System.....	15
Section 7	Verifying Operation.....	17
Section 8	Notice.....	19

Section 1 Configuration

Figure 1 and table 1 show the configuration and components of the user system interface board for the FP-112B package. Please make sure you have all of these components when unpacking.

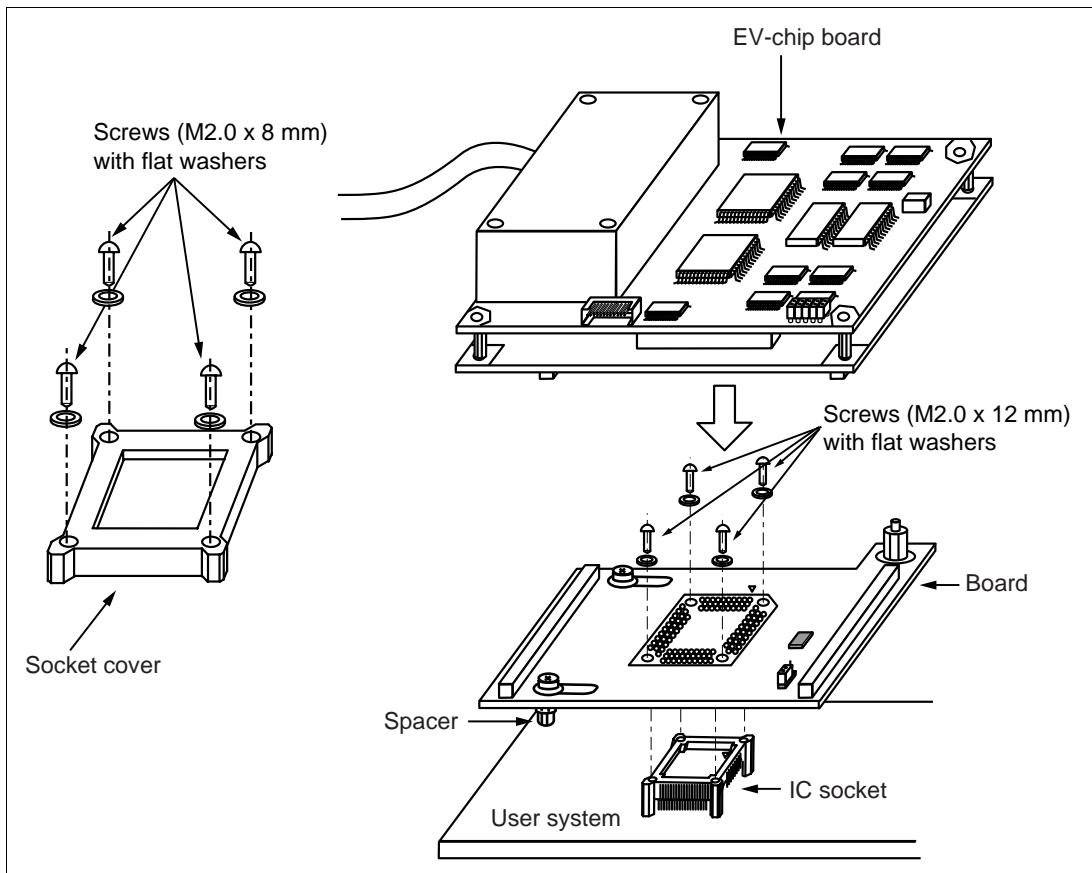


Figure 1 User System Interface Board for the SH7144 FP-112B Package

CAUTION

Use an IC149-112C15333-0B socket (manufactured by YAMAICHI ELECTRONICS Co., Ltd.) for the FP-112B package IC socket on the user system.

Table 1 HS7144ECH61H Components

No.	Component	Quantity	Remarks
1	Board	1	With two spacers (2.6MP x 6 mm)
2	IC socket	1	For the FP-112B package (to be mounted on the user system)
3	Socket cover	1	For the FP-112B package (for installing MCU)
4	Screws (M2.0 x 12 mm)	4	For fastening board (with four flat washers)
5	Screws (M2.0 x 8 mm)	4	For installing an FP-112B-packaged MCU (with four flat washers)
6	User's manual	1	User's manual for HS7144ECH61H (this manual)

Section 2 Environmental Conditions

Maintain the conditions in table 2 when using the emulator.

Table 2 Environmental Conditions

Item	Specifications
Temperature	Operating: +10 to +35°C Storage: -10 to +35°C
Humidity	Operating: 35 to 80% RH, no condensation Storage: 35 to 80% RH, no condensation
Vibration	Operating: 2.45 m/s max. Storage: 4.9 m/s max. Transportation: 14.7 m/s max.
Ambient gases	There must be no corrosive gases present.

2.1 Setting Operating Voltage and Operating Frequency

Connecting the user system interface board to the SH7046 series E6000H emulator enables emulation to be done using the user system operating voltage (V_{cc} : 3.0 to 3.6 V) Before determining the operating voltage and frequency of the user system, confirm the allowable range.

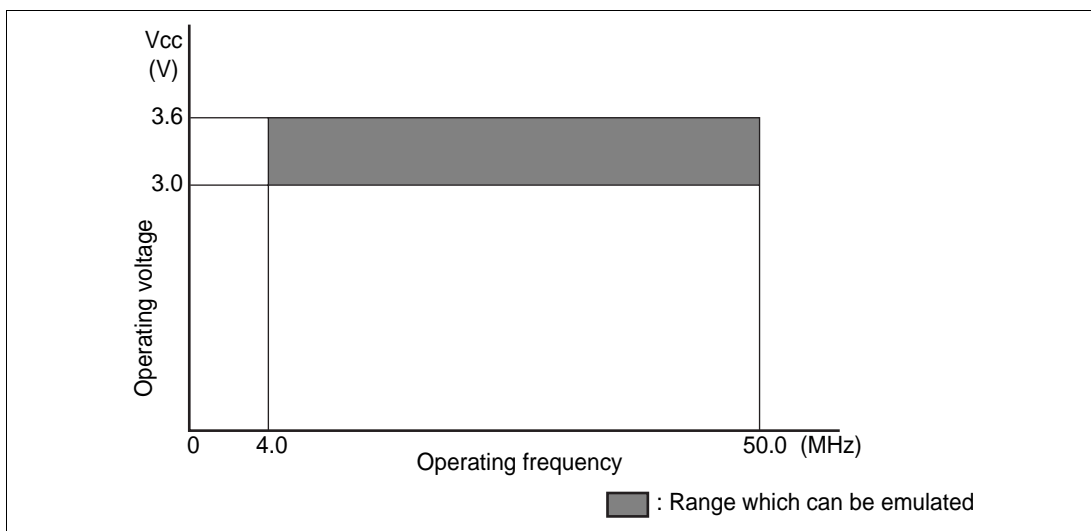


Figure 2 Allowable Operating Range

Section 3 Product Specifications

The specifications of this product are shown in table 3.

Table 3 Product Specifications

Item	Specifications
Target processor	SH7144F
Package	FP-112B
Function	Level limitation: This function keeps the output signal from 3-V emulator system equal to or less than power supply voltage of the user system (Vcc).
User-system operating conditions	Power supply voltage Vcc: 3.0 to 3.6 V A drop in the Vcc level of the user system is detected when the power supply voltage drops to 2.6 V or less.
Current consumption	Maximum of 100 mA.

Drop in Vcc Level Detection Function:

When the user system interface board is used, a drop is detected as follows:

When the power supply voltage (UVcc) of the user system is 2.6 V or less, the HEW will detect a Vcc drop. In this case, a sufficient voltage may not be supplied to the user system; ensure that the specified value of the power supply voltage is supplied.

Section 4 User Interface Specifications

The user system interface board incorporates a level conversion circuit supporting a low-voltage circuit. Accordingly, when connecting the user system to the emulator, pay attention to the signal delays and the number of FANINs and FANOUTs.

4.1 User System Interface Circuit

The user system interface circuit of the user system interface board is shown below.

(1) NMI and _RES

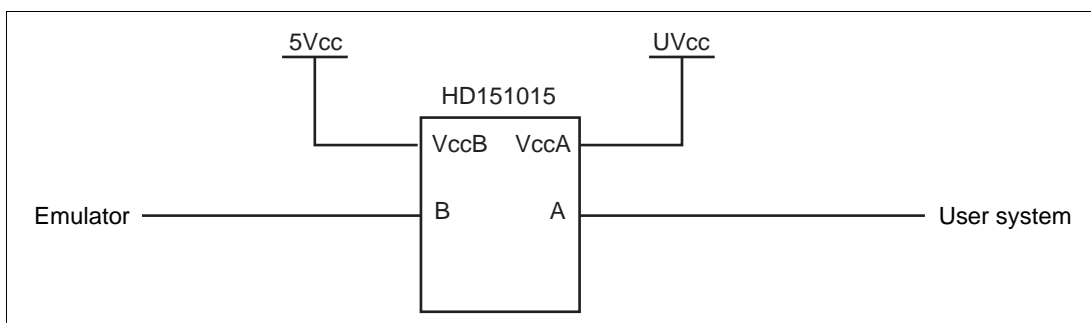


Figure 3 User System Interface Circuit for NMI and _RES

(2) PE15 to PE0, PC15 to PC0, PB9 to PB0, PA15 to PA0, and PD15 to PD0

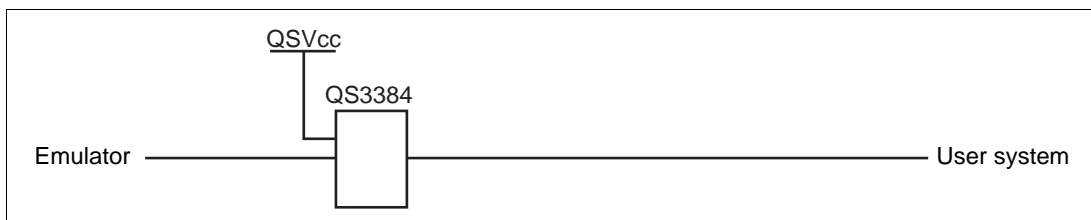


Figure 4 User System Interface Circuit for PE15 to PE0, PC15 to PC0, PB9 to PB0, PA15 to PA0, and PD15 to PD0

(3) AVcc and AN7 to AN0

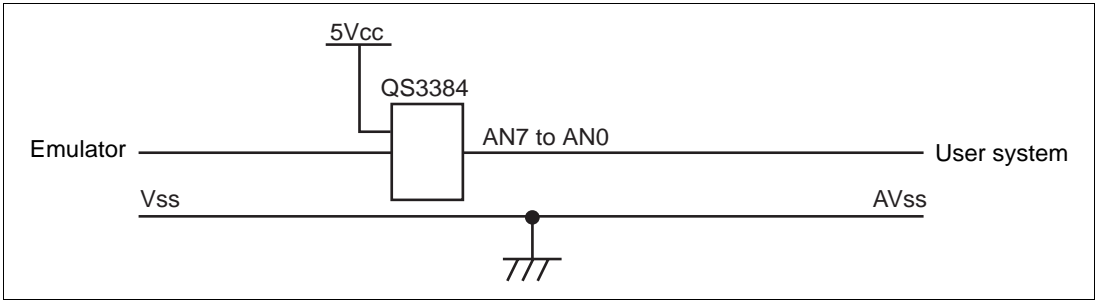


Figure 5 User System Interface Circuit for AVcc and AN7 to AN0

Section 5 Connection Procedures

5.1 Connecting User System Interface Board to User System

WARNING

Always switch OFF the user system and the emulator product before the USER SYSTEM INTERFACE BOARD is connected to or removed from any part. Before connecting, make sure that pin 1 on both sides are correctly aligned. Failure to do so will result in a FIRE HAZARD and will damage the user system and the emulator product or will result in PERSONAL INJURY. The USER PROGRAM will be LOST.

To connect the cable head to the user system, follow the instructions below.

5.1.1 Installing IC Socket

Solder the IC socket for an FP-112B package to the user system.

CAUTION

Be sure to completely solder the leads so that the solder slops gently over the leads and forms solder fillets. (Use slightly more solder than the MCU.)

5.1.2 Installing Cable Head

CAUTION

Check the location of pin 1 before inserting.

Align pin 1 on the IC socket for an FP-112B package on the user system with pin 1 on the user system interface board, and insert the user system interface board into the IC socket on the user system, as shown in figure 6.

5.1.3 Fastening Cable Head

CAUTION

- 1. Use a Phillip-type screwdriver whose head matches the screw head.**
- 2. The tightening torque must be 0.098 N•m or less.
If the applied torque cannot be accurately measured, stop tightening when the force required to turn the screw becomes significantly greater than that needed when first tightening. 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.**
- 3. 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.**

Fasten the user system interface board to the IC socket for an FP-112B package on the user system with the four screws (M2.0 x 12 mm) provided. Each screw should be tightened a little at a time, alternating between screws on opposing corners. Take special care, such as manually securing the IC socket soldered area, to prevent the soldered IC socket from being damaged by overtightening the screws or twisting the components.

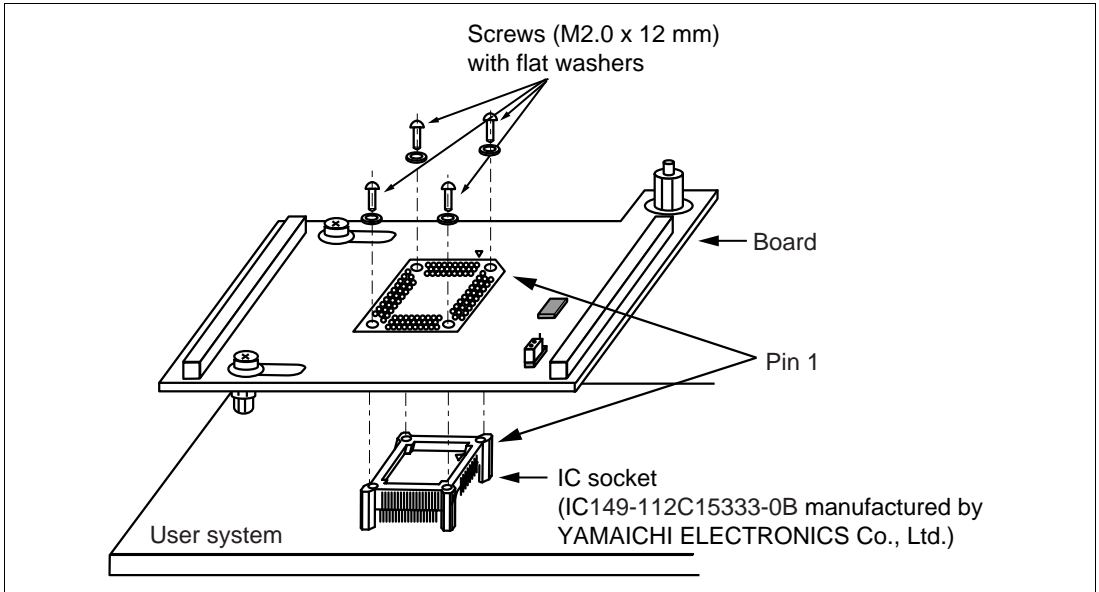


Figure 6 Connecting User System Interface Board to User System

5.2 Connecting User System Interface Board to EV-Chip Board

WARNING

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

- 1. Always switch OFF the user system and the emulator product before the USER SYSTEM INTERFACE BOARD is connected to or removed from any part. Before connecting, make sure that pin 1 on both sides are correctly aligned.**
- 2. The user system interface board dedicated to the emulator must be used.**

1. Make sure the user system and emulator are turned off.
2. Align the connectors on the board with those on the EV-chip board according to their numbers (figure 7).
3. Adjust the height of the spacer attached to the board with the user system.

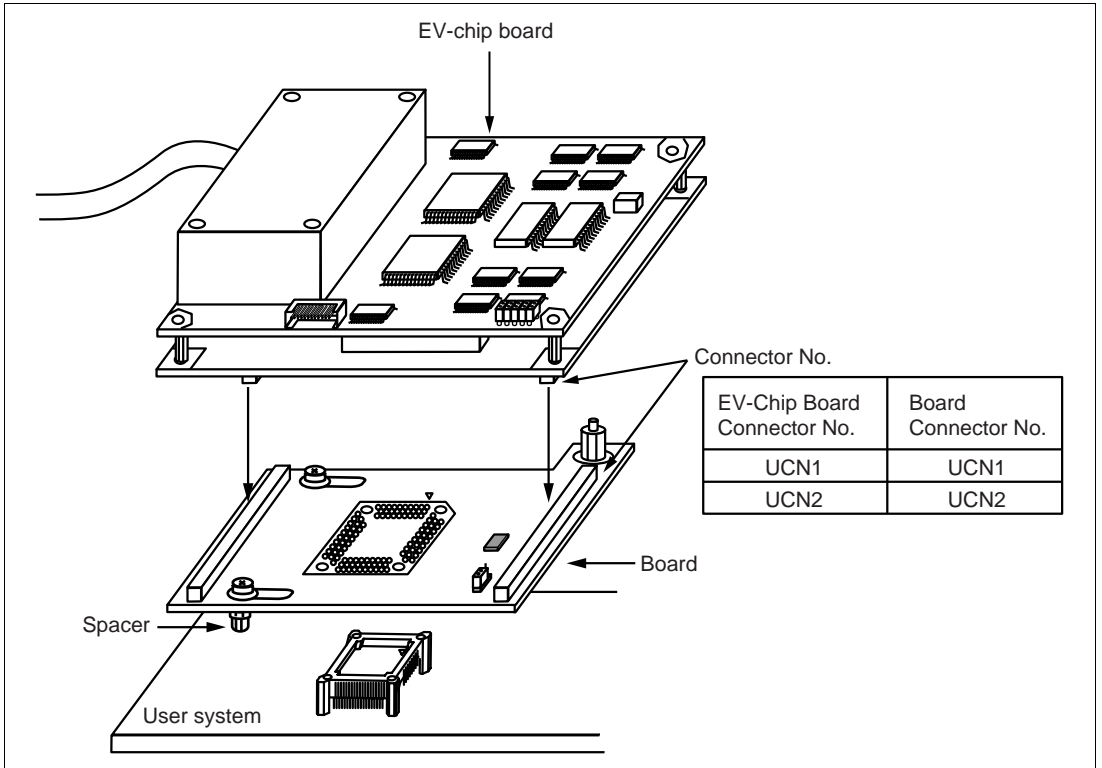


Figure 7 Connecting User System Interface Board to EV-Chip Board

5.3 Recommended Dimensions for User System Mount Pad (Footprint)

Figure 8 shows the recommended dimensions for the mount pad (footprint) for the user system with an IC socket for an FP-112B package (IC149-112C15333-0B: manufactured by YAMAICHI ELECTRONICS Co., Ltd.). Note that the dimensions in figure 8 are somewhat different from those of the actual chip's mount pad.

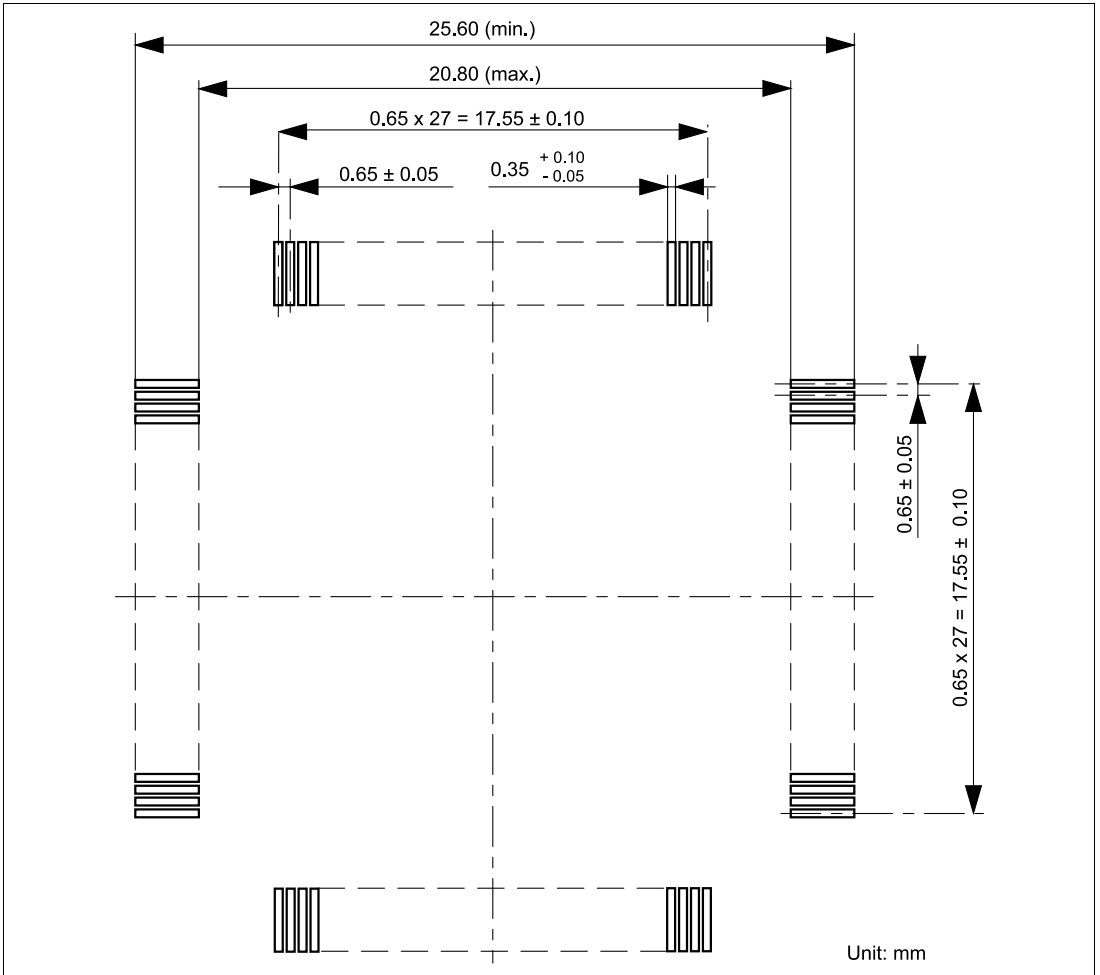


Figure 8 Recommended Dimensions for Mount Pad

5.4 Dimensions for EV-Chip Board and User System Interface Board

The dimensions for the EV-chip board and the user system interface board are shown in figure 9.

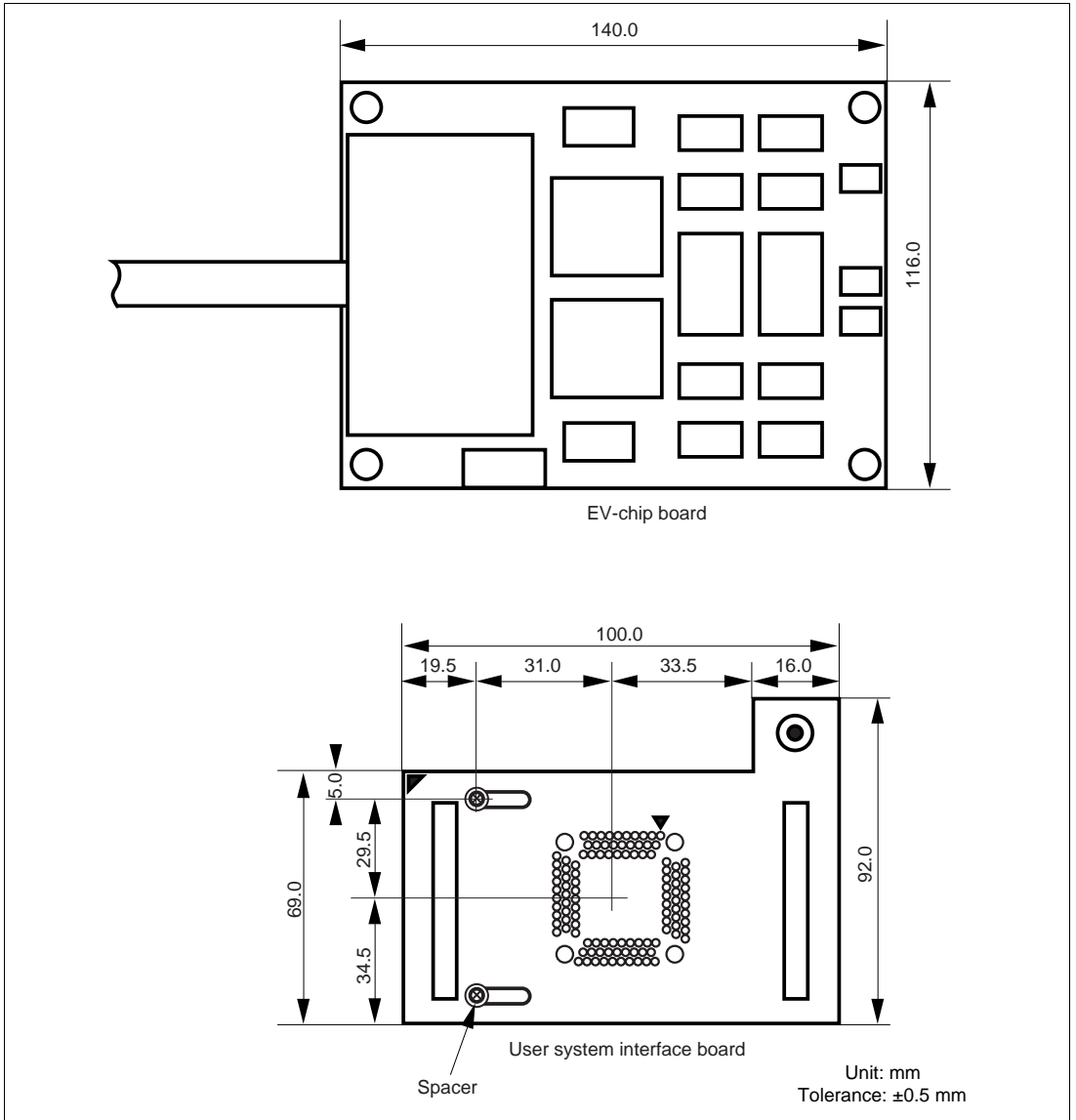


Figure 9 Dimensions for EV-Chip Board and User System Interface Board

5.5 Resulting Dimensions after Connecting User System Interface Board

The resulting dimensions, after connecting the user system interface board to the user system, are shown in figure 10.

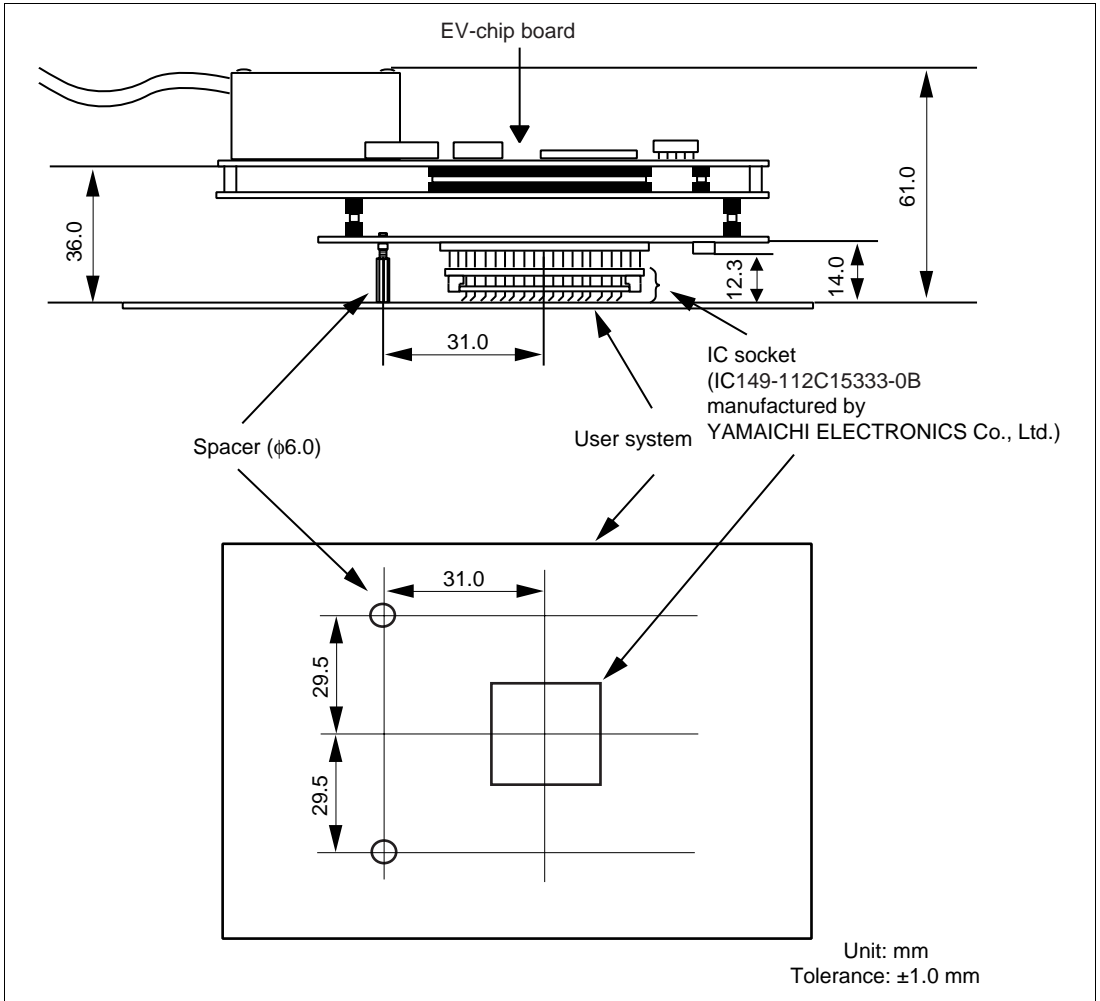


Figure 10 Resulting Dimensions after Connecting User System Interface Board

Section 6 Installing the MCU to the User System

CAUTION

- 1. Check the location of pin 1 before inserting.**
- 2. Use a Philips-type screwdriver whose head matches the screw head.**
- 3. The tightening torque must be 0.098 N•m or less.
If the applied torque cannot be accurately measured, stop tightening when the force required to turn the screw becomes significantly greater than that needed when first tightening. 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 MCU does not operate correctly, cracks might have occurred in the solder. Check conduction with a tester and re-solder the IC socket if necessary.**

Check the location of pin 1 before inserting the MCU into the IC socket on the user system, as shown in figure 11. After inserting the MCU, fasten the socket cover with the provided four screws (M2.0 x 8 mm). Take special care, such as manually securing the IC socket soldered area, to prevent the IC socket from being damaged by overtightening the screws or twisting the components.

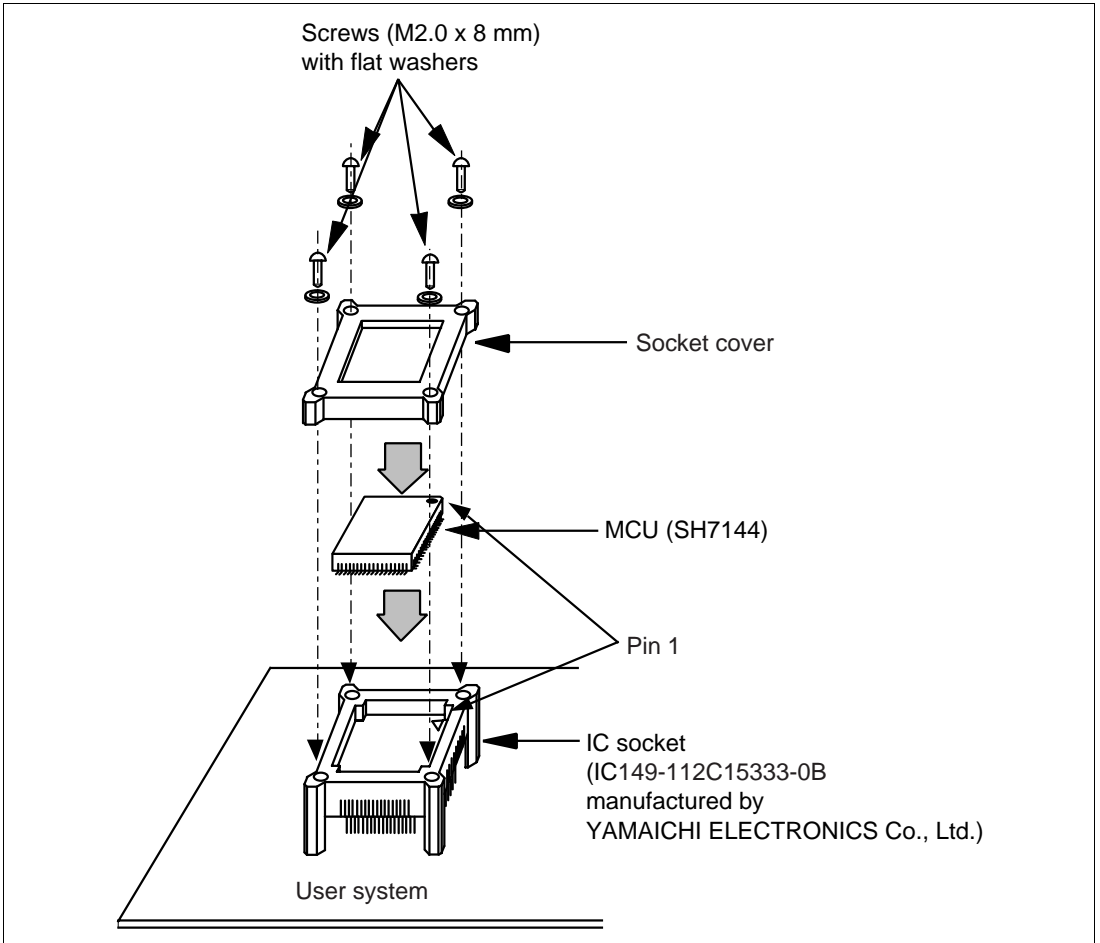


Figure 11 Installing MCU to User System

- To use the crystal oscillator mounted on the EV-chip board
Install a crystal oscillator into the crystal oscillator terminals on the EV-chip board.

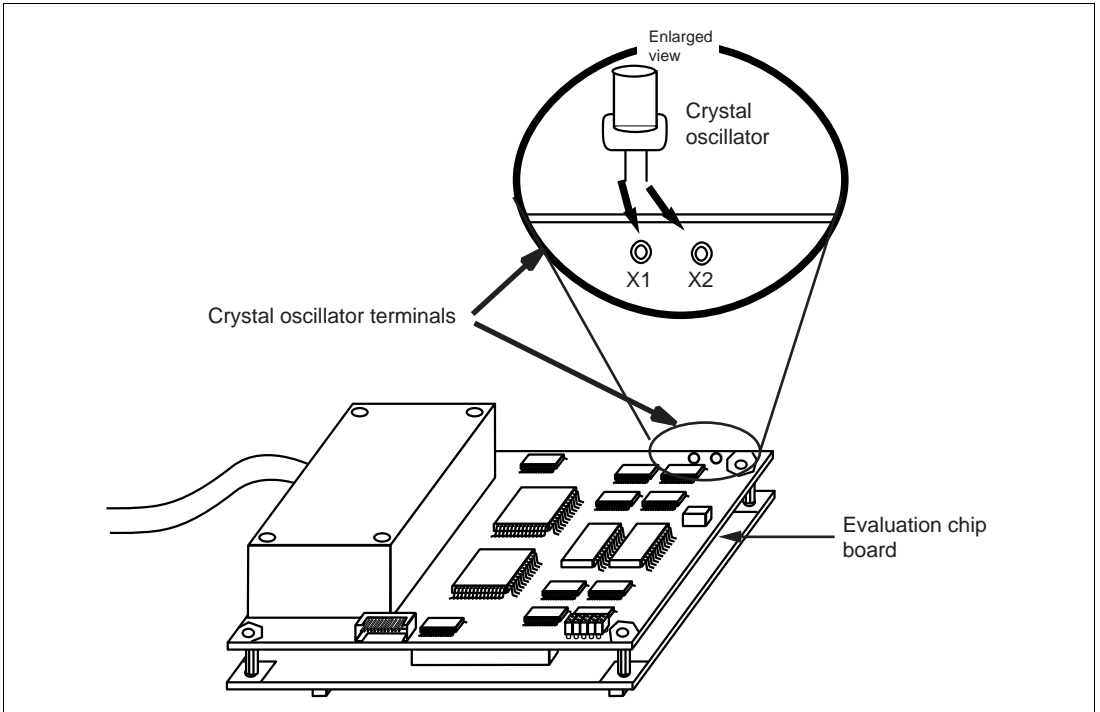


Figure 13 Installing the Clock Oscillator

Section 8 Notice

1. Before connecting any parts or cables, make sure that pin 1 on the both sides are correctly aligned.
2. Do not apply excessive force to the user system interface board while it is connected to the user system.
3. The dimensions of the recommended mount pad for the IC socket for this user system interface board are different from those of the MCU.
4. This user system interface board is specifically designed for the HS7046EPH60H emulator. Do not use this board with any other emulator.
5. When power is not supplied to the Vcc pin on the user system interface board, the emulator displays ** VCC DOWN. The emulator will not operate correctly.
6. The P1 short connector is used for testing. Do not remove the inserted jumper pin.

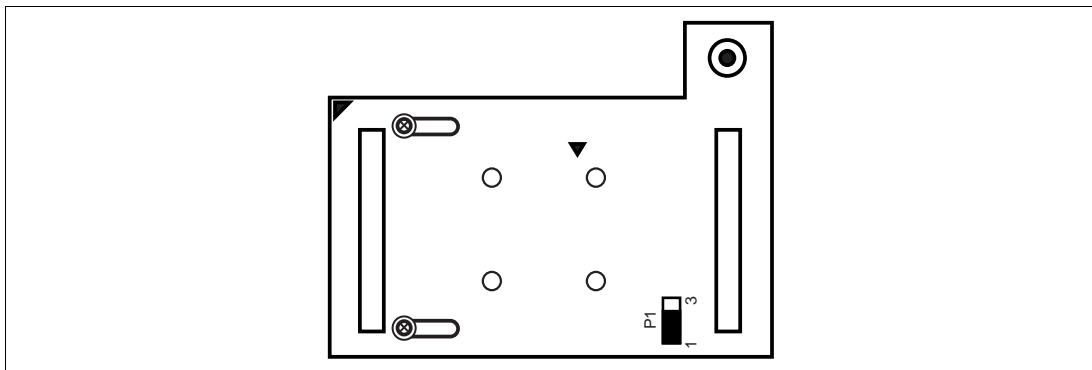


Figure 14 P1 Jumper Socket

SH7144 Group FP-112B
User System Interface Board
HS7144ECH61H User's Manual

Publication Date: Rev.4.00, January 29, 2004
Published by: Sales Strategic Planning Div.
Renesas Technology Corp.
Edited by: Technical Documentation & Information Department
Renesas Kodaira Semiconductor Co., Ltd.

**SH7144 Group FP-112B
User System Interface Board
HS7144ECH61H User's Manual**



Renesas Electronics Corporation

1753, Shimonumabe, Nakahara-ku, Kawasaki-shi, Kanagawa 211-8668 Japan

REJ10B0038-0400H