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.

RENESAS

User's Manual

QB-78K0RKX3

In-Circuit Emulator

Target Devices

78K0R/KE3
78K0R/KF3
78K0R/KG3
78K0R/KH3
78K0R/KJ3

Document No. U17866EJ4V0UM00 (4th edition)
Date Published April 2008 NS

[MEMO]

IECUBE is a registered trademark of NEC Electronics Corporation in Japan and Germany.
PC/AT is a trademark of International Business Machines Corporation.

- **The information in this document is current as of April 2008. The information is subject to change without notice. For actual design-in, refer to the latest publications of NEC Electronics data sheets or data books, etc., for the most up-to-date specifications of NEC Electronics products. Not all products and/or types are available in every country. Please check with an NEC Electronics sales representative for availability and additional information.**
- No part of this document may be copied or reproduced in any form or by any means without the prior written consent of NEC Electronics. NEC Electronics assumes no responsibility for any errors that may appear in this document.
- NEC 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 NEC Electronics products listed in this document or any other liability arising from the use of such products. No license, express, implied or otherwise, is granted under any patents, copyrights or other intellectual property rights of NEC Electronics or others.
- Descriptions of circuits, software and other related information in this document are provided for illustrative purposes in semiconductor product operation and application examples. The incorporation of these circuits, software and information in the design of a customer's equipment shall be done under the full responsibility of the customer. NEC Electronics assumes no responsibility for any losses incurred by customers or third parties arising from the use of these circuits, software and information.
- While NEC Electronics endeavors to enhance the quality, reliability and safety of NEC Electronics products, customers agree and acknowledge that the possibility of defects thereof cannot be eliminated entirely. To minimize risks of damage to property or injury (including death) to persons arising from defects in NEC Electronics products, customers must incorporate sufficient safety measures in their design, such as redundancy, fire-containment and anti-failure features.
- NEC Electronics products are classified into the following three quality grades: "Standard", "Special" and "Specific".
  The "Specific" quality grade applies only to NEC Electronics products developed based on a customer-designated "quality assurance program" for a specific application. The recommended applications of an NEC Electronics product depend on its quality grade, as indicated below. Customers must check the quality grade of each NEC Electronics product before using it in a particular application.
  "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.
  "Special": 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, life support systems and medical equipment for life support, etc.

The quality grade of NEC Electronics products is "Standard" unless otherwise expressly specified in NEC Electronics data sheets or data books, etc. If customers wish to use NEC Electronics products in applications not intended by NEC Electronics, they must contact an NEC Electronics sales representative in advance to determine NEC Electronics' willingness to support a given application.

(Note)
(1) "NEC Electronics" as used in this statement means NEC Electronics Corporation and also includes its majority-owned subsidiaries.
(2) "NEC Electronics products" means any product developed or manufactured by or for NEC Electronics (as defined above).

M8E 02. 11-1

[MEMO]

General Precautions for Handling This Product

1. Circumstances not covered by product guarantee

- If the product was disassembled, altered, or repaired by the customer
- If it was dropped, broken, or given another strong shock
- Use at overvoltage, use outside guaranteed temperature range, storing outside guaranteed temperature range
- If power was turned on while connection to the AC adapter, USB interface cable, or target system was in an unsatisfactory state
- If the cable of the AC adapter, the USB interface cable, the emulation probe, or the like was bent or pulled excessively
- If an AC adapter other than the supplied product was used
- If the product got wet
- If this product is connected to the target system when there is a potential difference between the GND of this product and GND of the target system.
- If the connectors or cables are plugged/unplugged while this product is in the power-on state.
- If excessive load is applied to the connectors or sockets (As for handling, please see **2.5 Mounting and Connecting Connectors)**.
- If a metal part of the power switch, cooling fan, or another such part comes in contact with an electrostatic charge.
- If the product is used or stored in an environment where an electrostatic or electrical noise is likely to occur.

2. Safety precautions

- If used for a long time, the product may become hot (50°C to 60°C). Be careful of low temperature burns and other dangers due to the product becoming hot.
- Be careful of electrical shock. There is a danger of electrical shock if the product is used as described above in **1. Circumstances not covered by product guarantee**.
- The AC adapter supplied with the product is exclusively for this product, so do not use it with other products.

INTRODUCTION

Readers

This manual is intended for users who wish to perform debugging using the QB-78K0RKX3. The readers of this manual are assumed to be familiar with the device functions and usage, and to have knowledge of debuggers.

Purpose

This manual is intended to give users an understanding of the basic specifications and correct usage of the QB-78K0RKX3.

Organization

This manual is divided into the following sections.

- General
- Setup procedure
- Settings at product shipment
- Cautions
- Characteristics of target interface

How to Read This Manual

It is assumed that the readers of this manual have general knowledge in the fields of electrical engineering, logic circuits, and microcontrollers.
This manual describes the basic setup procedures and how to set switches.

To understand the overall functions and usages of the QB-78K0RKX3
→ Read this manual in the order of the **CONTENTS**. The mark "<R>" shows major revised points. The revised points can be easily searched by copying an "<R>" in the PDF file and specifying it in the "Find what:" field.

To know the manipulations, command functions, and other software-related settings of the QB-78K0RKX3
→ See the user's manual of the debugger (supplied with the QB-78K0RKX3) to be used.

Conventions

Note:	Footnote for item marked with **Note** in the text
Caution:	Information requiring particular attention
Remark:	Supplementary information
Numeric representation:	Binary ... xxxx or xxxxB
	Decimal ... xxxx
	Hexadecimal ... xxxxH
Prefix indicating power of 2 (address space, memory capacity):	K (kilo): 2^{10} = 1,024
	M (mega): 2^{20} = $1,024^2$

Terminology

The meanings of the terms used in this manual are described in the table below.

Term	Meaning
Target device	This is the device to be emulated.
Target system	This is the system to be debugged. This includes the target program and the hardware provided by the user.
78K0R/Kx3	Generic name indicating 78K0R/KE3, 78K0R/KF3, 78K0R/KG3, 78K0R/KH3 and 78K0R/KJ3.
IECUBE™	Generic name for NEC Electronics' high-performance/compact in-circuit emulator.

Related Documents

Please use the following documents in conjunction with this manual.

The related documents listed below may include preliminary versions. However, preliminary versions are not marked as such.

<R> **Documents Related to Development Tools (User's Manuals)**

Document Name		Document Number
QB-78K0RKX3 In-Circuit Emulator		This manual
RA78K0R Ver. 1.20 Assembler Package	Operation	U18547E
	Language	U18546E
CC78K0R Ver. 2.00 C Compiler	Operation	U18549E
	Language	U18548E
ID78K0R-QB Ver. 3.20 Integrated Debugger	Operation	U17839E
PM+ Ver. 6.30 Project Manager		U18416E

Caution The related documents listed above are subject to change without notice. Be sure to use the latest version of each document for designing, etc.

CONTENTS

CHAPTER 1 GENERAL

The QB-78K0RKX3 is an in-circuit emulator for emulating the 78K0R/Kx3.

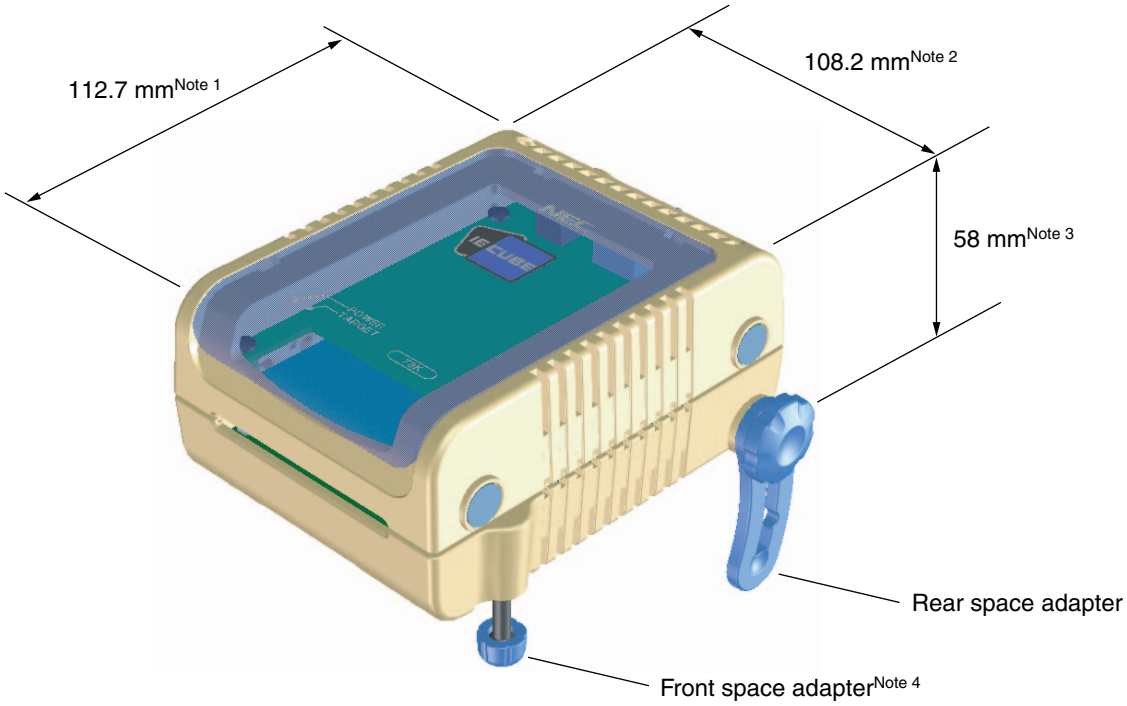
Hardware and software can be debugged efficiently in the development of systems in which the 78K0R/Kx3 is used. This manual descries basic setup procedures, hardware specifications, system specifications, and how to set switches.

1.1 Hardware Specifications

Table 1-1. QB-78K0RKX3 Hardware Specifications

Parameter		Specification	
Target device		78K0R/KE3, 78K0R/KF3, 78K0R/KG3, 78K0R/KH3, 78K0R/KJ3	
Operating voltage		1.8 to 5.5 V	
Operating frequency		High-speed system clock	2.7 V ≤ V_{DD} ≤ 5.5 V: 2 to 20 MHz 1.8 V ≤ V_{DD} ≤ 2.7 V: 2 to 5 MHz
		Internal high-speed oscillation clock	An 8 MHz clock is supplied from the oscillator in the QB-78K0RKX3
		Internal low-speed oscillation clock	A 240 kHz clock is supplied from the oscillator in the QB-78K0RKX3
		Subsystem clock	A 32.768 kHz clock is supplied from the oscillator in the QB-78K0RKX3
Operating temperature range		0 to 40°C (No condensation)	
Storage temperature range		−15 to 60°C (No condensation)	
External dimensions		See figure below	
Power consumption	AC adapter for QB-78K0RKX3	Output: DC15 V, 1 A Input: AC100 to 240 V	
	Target system power supply	Voltage: 1.8 to 5.5 V Current: approx. 4.1 mA MAX.	
Weight		Approx. 400 g	
Host interface		USB interface (1.1, 2.0)	

<R>



Notes 1. Does not include projection of power switch

2. Includes projection of screw that fixes rear space adapter

3. Rear space adapter can adjust the height from 30 mm (longest) to 0 mm (shortest)

4. Front space adapter can adjust the height from 20 mm (longest) to 5 mm (shortest)

1.2 System Specifications

This section shows the QB-78K0RKX3 system specifications.

Table 1-2. QB-78K0RKX3 System Specifications (1/2)

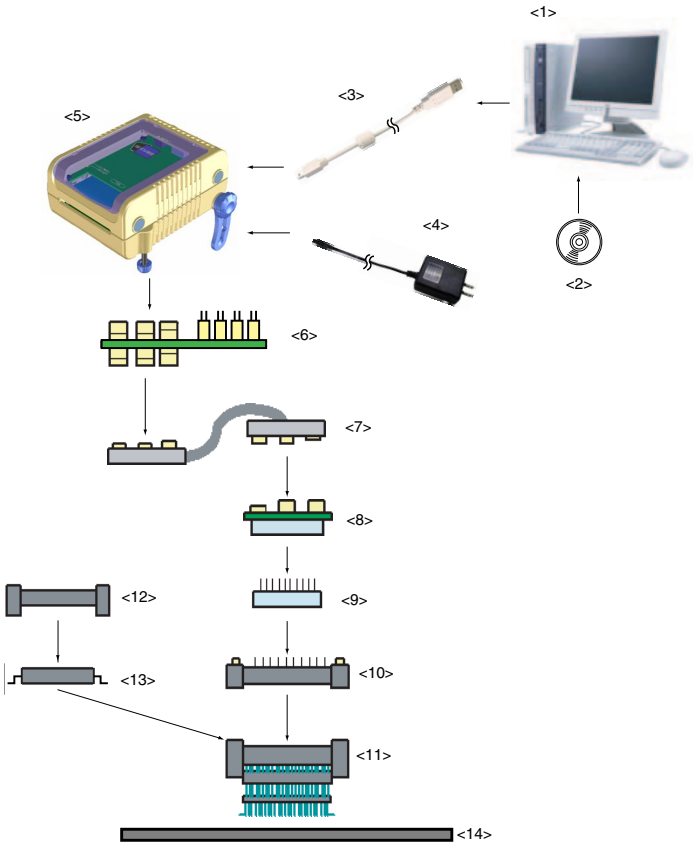
Parameter		Specification
Emulation memory capacity	Internal ROM	512 KB (MAX.)
	Internal RAM	61.75 KB (MAX.)
Program execution functions	Real-time execution function	Go, Start from Here, Come Here, Restart, Return Out, Ignore break points and Go
	Non-real-time execution function	Step In, Next Over, Slowmotion, Go & Go
Memory manipulation		Available (initialize, copy, compare)
Register manipulation		Available (general-purpose registers, control registers, SFRs)
Disassemble function		Available
Local variable view		Local variables
Watch data view		Local variables, global variables, or else
Stack trace view		Available
Break functions	Event break	Execution: 8 points Access: 8 points
	Software break	2000 points
	Pre-execution break	4 to 8 points[Note]
	Fail-safe break	Non-map, write protect, SFR illegal access, stack overflow, or else
	Other	Forcible break, trace full break, trace delay break, timeout break, timer overflow break
Trace functions	Trace data types	Program address, program data, access address, access data, status, time tag
	Trace modes	Unconditional trace, section trace, qualify trace, delay trigger trace
	Trace functions	Non-stop, full stop, full break, delay trigger stop, delay trigger break
	Memory capacity	128K frames
Real-time RAM monitoring function		All internal RAM spaces
Time measurement functions	Measurement clock	60 MHz
	Measurement objects	Start through end of program execution Start event through end event
	Maximum measurement time	Approx. 40 hours and 43 minutes (Resolution: 17 ns)
	Number of timers for measurement	Start through end of program execution: 1 Start event through end event: 2
	Measurement results	Execution time (start through end of execution) Maximum, minimum, average, total, pass count (between events)
	Other	Timer overflow break function, timeout break function
Other functions		Command functions set in the console, mapping function, event function, coverage function, snapshot function, DMM function, power-off emulation function, pin mask function, flash self programming emulation function

Note The number of breaks that can be set varies depending on the location where the break is set.

1.3 System Configuration

This section shows the system configuration when using the QB-78K0RKX3 connected to a PC (Windows PC (Windows2000 and WindowsXP), PC/AT™ compatible). Connection is possible even without optional products.

Figure 1-1. System Configuration



<1> Host machine : Windows PC (Windows2000 and WindowsXP), IBM PC/AT compatible can be used
<2> ID78K0R-QB Disk/Accessory Disk : Debugger, USB drivers, manual, etc.
<3> USB interface cable : Cable connecting QB-78K0RKX3 to host machine
<4> AC adapter : Support input AC100 to 240 V
<5> QB-78K0RKX3 : This product
<6> Check pin adapter (optional) : Adapter used for monitoring waveforms with oscilloscope
<7> Emulation probe : High-characteristic FPC type emulation probe
<8> Exchange adapter : Adapter that performs pin conversion
<9> Space adapter (optional) : Adapter used for height adjustment
<10> YQ connector : Connector that connects exchange adapter to target connector
<11> Target connector : Connector soldered to target system
<12> Mount adapter (optional) : Adapter used for mounting target device into socket
<13> Device : Target device
<14> Target system

Remarks 1. Obtain device files from the NEC Electronics website.
http://www.necel.com/micro/ods/eng/
2. Refer to **1.5 Package Contents** for the purchase forms of the above products.
3. As for handling of connectors, refer to **2.5 Mounting and Connecting Connectors**.

1.4 System Configuration for Each Target Device

The following table lists the system configuration for each target device of the QB-78K0RKX3.

<R> **Table 1-3. Adapters and Connectors for Each Target Device**

Target Device	Package	Exchange Adaptor	Space Adaptor	YQ Connector	Target Connector	Mount Adaptor
78K0R/KE3	64GB	QB-64GB-EA-08T	QB-64GB-YS-01T	QB-64GB-YQ-01T	QB-64GB-NQ-01T	QB-64GB-HQ-01T
	64GK	QB-64GK-EA-06T	QB-64GK-YS-01T	QB-64GK-YQ-01T	QB-64GB-NQ-01T	QB-64GK-HQ-01T
78K0R/KF3	80GC	QB-80GC-EA-06T	QB-80GC-YS-01T	QB-80GC-YQ-01T	QB-80GC-NQ-01T	QB-80GC-HQ-01T
	80GK	QB-80GK-EA-06T	QB-80GK-YS-01T	QB-80GK-YQ-01T	QB-80GK-NQ-01T	QB-80GK-HQ-01T
78K0R/KG3	100GC	QB-100GC-EA-01T	QB-100GC-YS-01T	QB-100GC-YQ-01T	QB-100GC-NQ-01T	QB-100GC-HQ-01T
	100GF	QB-100GF-EA-04T	QB-100GF-YS-01T	QB-100GF-YQ-01T	QB-100GF-NQ-01T	QB-100GF-HQ-03T
78K0R/KH3	128GF	QB-128GF-EA-01T	QB-128GF-YS-01T	QB-128GF-YQ-01T	QB-128GF-NQ-01T	QB-128GF-HQ-01T
78K0R/KJ3	144GJ	QB-144GJ-EA-05T	QB-144GJ-YS-01T	QB-144GJ-YQ-01T	QB-144GJ-NQ-01T	QB-144GJ-HQ-01T

<R> **Table 1-4. Common Probe and Adapter**

Name	Part Number
Check pin adapter	QB-144-CA-01
Emulation probe	QB-144-EP-02S

<R> The adapter and connector for each device, and common probe and adapter are sold separately. An exchange adapter, a YQ connector, a target connector, and an emulation probe are included, depending on the order product name. For details, refer to **1.5 Package Contents.**

Remark For the package drawings of the connector, adapter, and probe, refer to the following URL.
http://www.necel.com/micro/en/development/asia/Emulator/IE/iecube.html

1.5 Package Contents

<R> The included products are described for each order product name.

Products supplied with QB-78K0RKX3-ZZZ

1: QB-78K0RKX3
2: AC adapter
3: USB interface cable (2 meters)
4: Probe holder
5: Online user registration card (warranty card and software contract in one)
6: ID78K0R-QB Disk (CD-ROM)
7: Accessory Disk (CD-ROM)
8: IECUBE Setup Manual (Japanese/English)
9: Packing list
10: QB-MINI2

Products supplied with QB-78K0RKX3-T144GJ

1 to 10
11: Emulation probe QB-144-EP-02S
12: Exchange adapter QB-144GJ-EA-05T
13: YQ connector QB-144GJ-YQ-01T
14: Target connector QB-144GJ-NQ-01T

Products supplied with QB-78K0RKX3-T128GF

1 to 10
11: Emulation probe QB-144-EP-02S
12: Exchange adapter QB-128GF-EA-01T
13: YQ connector QB-128GF-YQ-01T
14: Target connector QB-128GF-NQ-01T

Products supplied with QB-78K0RKX3-T100GC

1 to 10
11: Emulation probe QB-144-EP-02S
12: Exchange adapter QB-100GC-EA-01T
13: YQ connector QB-100GC-YQ-01T
14: Target connector QB-100GC-NQ-01T

Products supplied with QB-78K0RKX3-T100GF

1 to 10
11: Emulation probe QB-144-EP-02S
12: Exchange adapter QB-100GF-EA-04T
13: YQ connector QB-100GF-YQ-01T
14: Target connector QB-100GF-NQ-01T

Products supplied with QB-78K0RKX3-T80GC

1 to 10
11: Emulation probe QB-144-EP-02S
12: Exchange adapter QB-80GC-EA-06T

13: YQ connector QB-80GC-YQ-01T
14: Target connector QB-80GC-NQ-01T

Products supplied with QB-78K0RKX3-T80GK

1 to 10
11: Emulation probe QB-144-EP-02S
12: Exchange adapter QB-80GK-EA-06T
13: YQ connector QB-80GK-YQ-01T
14: Target connector QB-80GK-NQ-01T

Products supplied with QB-78K0RKX3-T64GB

1 to 10
11: Emulation probe QB-144-EP-02S
12: Exchange adapter QB-64GB-EA-08T
13: YQ connector QB-64GB-YQ-01T
14: Target connector QB-64GB-NQ-01T

Products supplied with QB-78K0RKX3-T64GK

1 to 10
11: Emulation probe QB-144-EP-02S
12: Exchange adapter QB-64GK-EA-06T
13: YQ connector QB-64GK-YQ-01T
14: Target connector QB-64GK-NQ-01T

CHAPTER 2 SETUP PROCEDURE

This chapter explains the QB-78K0RKX3 setup procedure.

Setup can be completed by performing installation setup in the order in which it appears in this chapter.

Perform setup along the lines of the following procedure.

See **2.1 Names and Functions of Hardware** for clock positions.

Clock settings

Hardware settings are not required if the clock internally generated from the emulator is used.

If an oscillator must be mounted, see **2.2 Removal of Acrylic Board** and **2.3 Clock Settings**.

↓

Software settings

See **2.4 Software Settings**.

↓

Mounting and connecting connectors

See **2.5 Mounting and Connecting Connectors**.

↓

Connecting QB-78K0RKX3 to target system

See **2.6 Connecting QB-78K0RKX3 to Target System**.

↓

Connecting USB interface cable and AC adapter

See **2.8 Connecting USB Interface Cable and AC Adapter**.

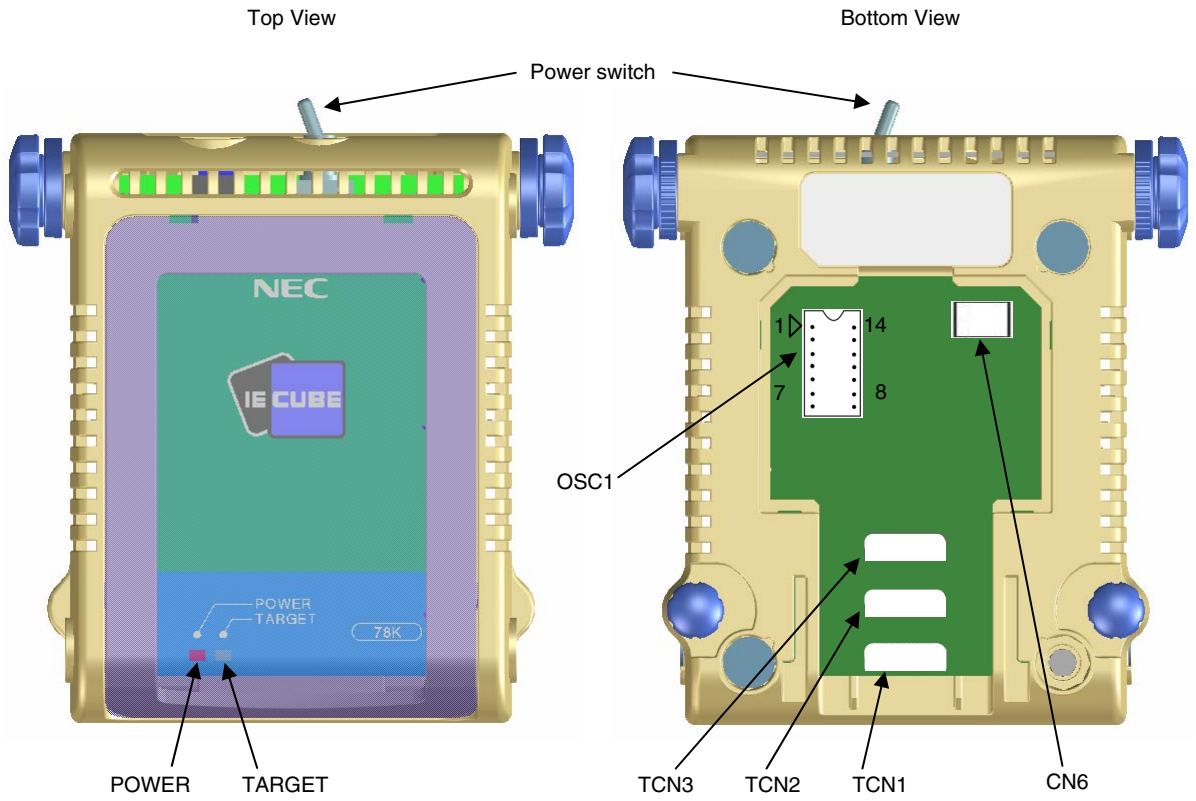
↓

Switching power on and off

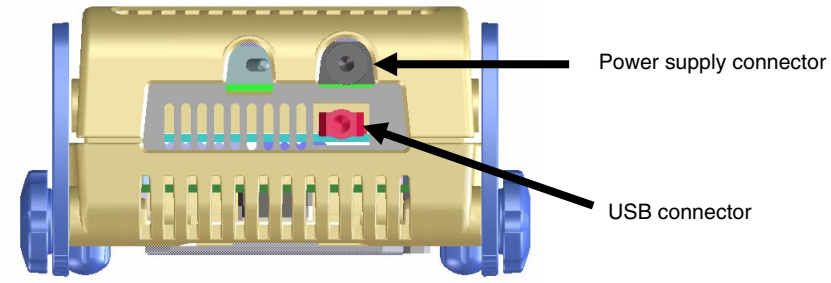
See **2.9 Switching Power On and Off**.

2. 1 Names and Functions of Hardware

Figure 2-1. Names of Parts of QB-78K0RKX3



Side View



(1) TCN1, TCN2, TCN3

These are connectors for connecting a check pin adapter or emulation probe.

(2) OSC1

This is a socket for mounting the oscillator.

(3) CN6

This is a connector for the shipment inspection. It is not something that the user will need.

(4) POWER (Red LED)

This is an LED that shows whether the power supply of the QB-78K0RKX3 is switched on.

LED State	QB-78K0RKX3 State
Lit	Power switch ON
Not lit	Power switch OFF or AC adapter not connected to QB-78K0RKX3
Blinking	Internal error occurred (Contact an NEC Electronics sales representative or distributor)

(5) TARGET (Green LED)

This is an LED that shows whether the power supply of the target system is switched on.

LED State	Target System State
Lit	Target system power supply ON
Not lit	Target system power supply OFF or target system not connected

(6) Power switch

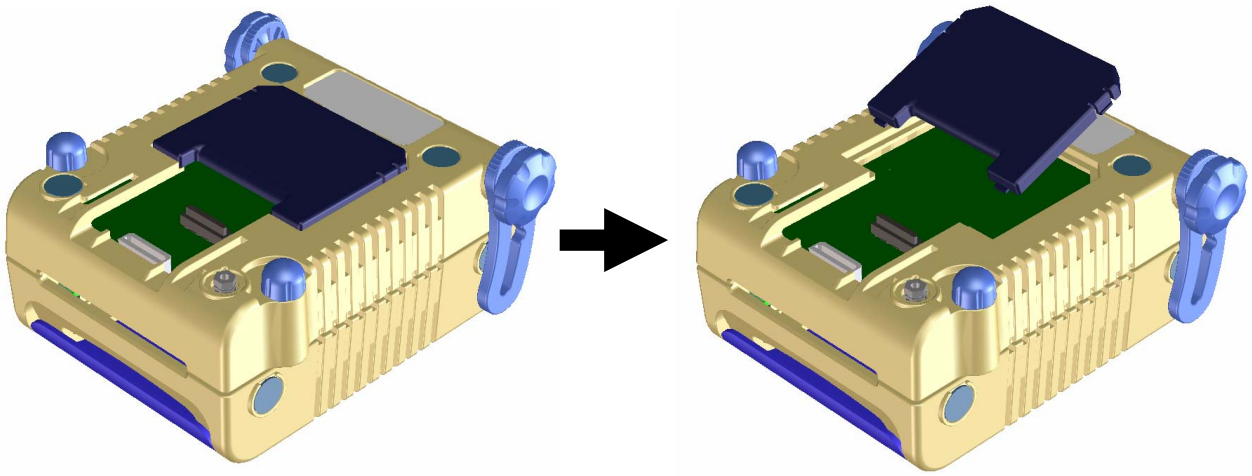
This is the power switch of the QB-78K0RKX3.

It is OFF at shipment.

2. 2 Removal of Acrylic Board

To modify the clock setting, the acrylic board on the bottom of the QB-78K0RKX3 must be removed. The acrylic board can be removed by lifting it up.

Figure 2-2. Acrylic Board Removal Method



<R> 2. 3 Clock Settings

2.3.1 Overview of clock settings

The following four types of clock settings are available.

Each clock setting is listed below.

Clock Used	Clock Supply	Debugger Setting (in Configuration Dialog)
(1) High-speed system clock[Note 1] (X1 oscillator or External input)	(a) When the clock generated within the emulator is used	System
	(b) When the clock is supplied from the target system	External
	(c) When the oscillator (OSC1) mounted onto the emulator is used	Clock Socket
(2) Internal high-speed oscillation clock	Uses the clock internally generated from the emulator	–
(3) Internal low-speed oscillation clock	Uses the clock internally generated from the emulator	–
(4) Subsystem clock[Note 2] (XT1 oscillator)	(a) When the clock generated within the emulator is used	System
	(b) When the clock is supplied from the target system	External

Notes 1. First, select “System” in the debugger settings (refer to (a) When the clock generated within the emulator is used, in (1) High-speed system clock).

If there is no clock that can be selected, follow the descriptions below.

- If the target system clock can supply a square wave for the emulator:
  Select “External” in the debugger settings (refer to (b) When the clock is supplied from the target system, in (1) High-speed system clock).
- If the target system clock cannot supply a square wave for the emulator:
  Mount onto the emulator the oscillator of the clock to be used and select “Clock Socket” in the debugger settings (refer to (c) When the oscillator (OSC1) mounted onto the emulator is used, in (1) High-speed system clock).

2. First, select “System” in the debugger settings (refer to (a) When the clock generated within the emulator is used, in (4) Subsystem clock).

If there is no clock that can be selected, it can be supplied from the target system clock. A square wave, however, must be supplied (refer to (b) When the clock is supplied from the target system, in (4) Subsystem clock).

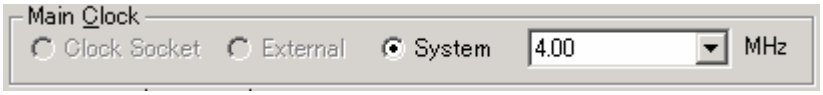
Oscillation with the resonator on the target system is not supported. Therefore, the in-circuit emulator cannot emulate the oscillation operation of the clock on the target system.

(1) High-speed system clock

The clock settings are listed below.

Table 2-1. Settings for High-Speed System Clock

Type of Clock to Be Used	OSC1	Debugger Setting
(a) When the clock generated within the emulator is used	–	System
(b) When the clock is supplied from the target system[Note]	–	External
(c) When the oscillator (OSC1) mounted onto the emulator is used	Oscillator mounted	Clock Socket



Note This setting is not possible when TARGET LED is not lit.

Remarks 1. Settings other than the above are prohibited.

2. Selection of (a) or (b) is possible regardless of whether the oscillator is not mounted in the OSC1socket.

(a) When the clock generated within the emulator is used

Select the “System” in the debugger and select the desired frequency from the drop-down list.

The following frequencies are selectable.

2.00, 3.00, 3.57, 4.00, 4.19, 4.91, 5.00, 6.00, 8.00, 8.38, 10.00, 12.00, 16.00, 20.00 [MHz]

(b) When the clock is supplied from the target system

Select the “External” in the debugger. The clock input from the target system is then used.

Oscillation with the resonator on the target system is not supported. To input a clock from the target system, input to the clock pin (X2) the square-wave signal with the same voltage potential as that of the target device supply voltage (V_{DD}). Inputting the inverted signal to X1 is not necessary.

The selectable frequencies are same as those of the target device.

(c) When the oscillator (OSC1) mounted onto the emulator is used

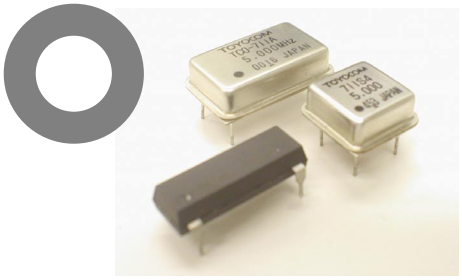
Mount an oscillator in the OSC1 socket in the emulator and then select the “Clock socket” in the debugger. The clock generated from the oscillator mounted on the emulator is used.

The selectable frequencies are same as those of the target device.

As an oscillator[Note] to be mounted in the OSC1 socket in the emulator, use the one that satisfies the following specifications.

- Supply voltage: 5 V
- Output level: CMOS

Note An oscillator that uses a resonator cannot be used.



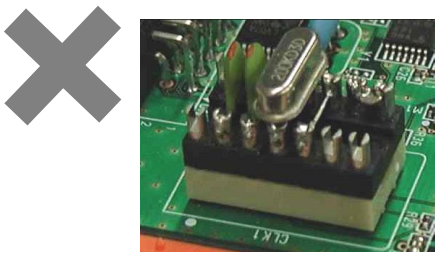
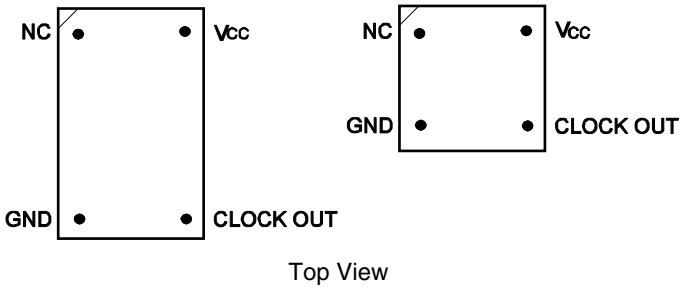
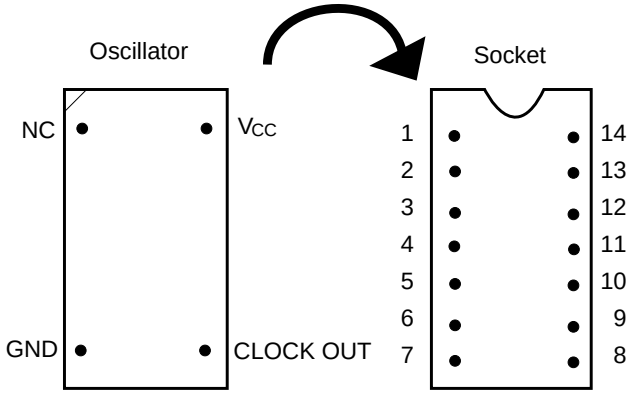


Figure 2-3. Oscillator Shape



Top View

Figure 2-4. Mapping of Oscillator to Socket



Oscillator	OSC1 Pin Number
NC	1
GND	4
	7
CLOCK OUT	8
	11
VCC	14

Remark Insert the oscillator into the socket, take care for the pin 1 position.

(2) Internal high-speed oscillation clock

The debugger setting is not necessary.

The use of the internal high-speed oscillation clock can be specified in the user program.

(3) Internal low-speed oscillation clock

The debugger setting is not necessary.

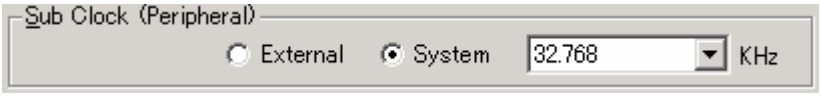
The use of the internal low-speed oscillation clock can be specified in the user program.

(4) Subsystem clock

The clock settings are listed below.

Table 2-2. Settings for Subsystem Clock

Type of Clock to Be Used	Debugger Setting
(a) When the clock generated within the emulator is used	System
(b) When the clock is supplied from the target system[Note]	External



Note This setting is not possible when TARGET LED is not lit.

Remark Settings other than above are prohibited.

(a) When the clock generated within the emulator is used

Select the “System” in the debugger and select “32.768” [kHz] as the frequency from the drop-down list.

32.768 [kHz]

Remark “38.400” [kHz] can also be selected from the list, but do not select this frequency; it is not supported by the device.

(b) When the clock is supplied from the target system

Select the “External” in the debugger. The clock input from the target system is then used.

Oscillation with the resonator on the target system is not supported. To input a clock from the target system, input to the clock pin (XT2) the square-wave signal with the same voltage potential as that of the target device supply voltage (V_{DD}). Inputting the inverted signal to XT1 is not necessary.

The selectable frequencies are same as those of the target device.

2. 4 Software Settings

For details, see the **ID78K0R-QB Ver. 3.20 Integrated Debugger Operation User's Manual** (U17839E).

2. 5 Mounting and Connecting Connectors

This section describes the methods of connecting the QB-78K0RKX3 and target system.

Make connections with both the QB-78K0RKX3 and target system powered OFF.

The following abbreviations are used in this section:

- TC: Target connector
- YQ: YQ connector
- EA: Exchange adapter
- MA: Mount adapter
- CA: Check pin adapter
- SA: Space adapter

2.5.1 Mounting TC to target system

(1) Thinly apply a two-component epoxy adhesive (hardening time at least 30 minutes) to the ends of the four projections on the base of the TC and adhere the TC to the user board (clean the surface of the target system board using alcohol or the like). If alignment of target system pads to TC leads is difficult, align them as in (2).

(2) Align by inserting the guide pins for alignment for the TC (NQGUIDE) through the pin holes on the top of the TC. Accessory holes are ϕ1.0 mm non-through holes in two or three places.
(For hole positions, see the particular TC drawing.)

(3) Solder after fitting the MA to the TC. This is to prevent troubles such as flux or solder splashing and adhering to the TC contact pins when soldering.

- Soldering conditions — Solder reflow: 260°C × 10 seconds or less
  Manual soldering: 350°C × 5 seconds or less (1 pin)

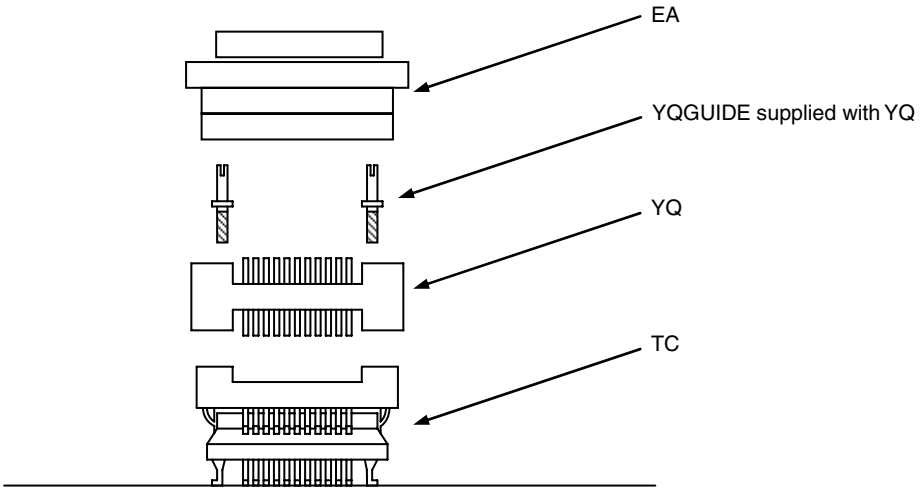
Caution Do not perform washing by flux immersion or vapor.

(4) Take away the guide pins.

<R> **2.5.2 Mounting YQ to TC**

(1) After confirming that there are no broken or bent YQ contact pins, fit the YQ in the TC and fasten it using the supplied YQGUIDE (for the fastening method, see the next step, (2)). If repeatedly inserting and removing, be sure to inspect the YQ pins before fitting. If pins are bent, correct them using something thin and flat such as the edge of a knife.

(2) Fasten YQ to the TC on the target system using the supplied YQGUIDE. Fasten the screws equally in the four corners using the supplied flat-blade screwdriver or a torque driver. The tightening torque of the YQGUIDE is 0.054 Nm (MAX.). Too great tightening causes bad connections.
However, four screws for fitting to the TC (M2 x 10 mm / 4 units) are included with the YQ.



2.5.3 Plugging EA into YQ

Match the pin 1 position of the YQ or SA (corner cuts match in both) to the pin 1 position of the EA and plug in.

- When plugging or unplugging, press on the TC, YQ, and SA with a finger so that there is no force on the TC.
- When plugging or unplugging, be careful of the direction of wiggling.

As a tool when unplugging, insert some kind of thin non-conductive material such as a wooden stick between the YQ (SA) and EA and wiggle while slowly unplugging. Be careful since the connector will be damaged if this is done in the wrong direction.

2.5.4 Precautions for handling TC, YQ, SA, and CA

(1) When taking the TC from the box, press down on the body and take out the sponge first.

(2) Since the pins of the YQ are thin and easily bent, be careful. When inserting it in the TC, confirm that there are no bent pins.

(3) When screwing a YQ soldered to a board to the TC, fasten the screws in four places in turn using a #0 or #1 Phillips precision screwdriver or torque driver after tentatively tightening them. Fix the torque at 0.054 Nm (MAX.).

If just one place is overtightened, it may cause poor contact. Moreover, a board being connected to the YQ must have accessory holes in prescribed positions (four places: ϕ2.3 mm or ϕ3.3 mm). The ϕ3.8 mm or ϕ4.3 mm that is the screw head size is an area where wiring is prohibited.

(4) In YQ and SA removal, since there is a danger of YQ pins being bent or broken when prying and wiggling, remove them gradually using a flatbladed screwdriver from four directions. Moreover, to connect and use the YQ and SA, screw the YQ to the TC according to the YQGUIDE (included with the YQ) using a 2.3 mm flatbladed screwdriver and then connect it to the SA. Fix the torque at 0.054 Nm (MAX.). If even one place is overtightened, it may cause poor contact.

(5) For the TC, YQ, and SA, since there is a danger that washing fluid on the structure will remain in the connector, do not perform washing.

(6) TC, IC, and YQ cannot be used in combination.

(7) A TC/YQ system cannot be used in an environment of vibrations or shocks.

(8) It is assumed that this product will be used in system development and evaluation. Moreover, when used in Japan, Electrical Appliance and Material Control Law and electromagnetic disturbance countermeasures have not been applied.

(9) Since there are rare cases of shape change if the box is left for a long time in a place where it is 50°C or higher, for safekeeping, store it in a place where it is no higher than 40°C and direct sunlight does not hit it.

(10) For details about handling the TC, YQ, and SA, see the NQPACK series technical materials at the website of Tokyo Eletech Corporation.

URL: http://www.tetc.co.jp/

(11) CA

The CA is an optional product for IECUBE, and can be used to measure the waveform between IECUBE and the target system.

Since the pins on the CA do not correspond to the pin layout in each device, the pin header cover must be mounted according to the device to be used. For mounting methods of the pin header cover, refer to **[Related Information]** on the following URL.

http://www.necel.com/micro/english/iecube/index.html

2.5.5 Precautions for mounting IC using TC and MA

(1) Confirm that there is no weld flash in the resin (sealant part) of the IC. If there is weld flash, remove it using a knife or the like.

(2) Confirm that there is no weld flash breaking or bending of IC leads. In particular, confirm the planarity of IC leads. If there is abnormality in the planarity, correct that portion.

(3) Viewing the TC contact pins from the top, if there are foreign bodies on them, remove them using a brush or the like.

After confirming (1) to (3), fit the IC to the TC. Also fit the MA.

(4) Put the supplied M2 x 6 mm screws in the four accessory holes of the MA and fasten the screws in opposite corners. At that time, use either the dedicated screwdriver that is supplied or a torque driver to fasten them equally in turn with a tightening torque of 0.054 Nm (MAX.). Since the contact is poor if tightening is too great, once you have lightly fastened the MA screws, tighten them again.

(5) Depending on the use environment, when starting up a device that has been left for a long time, starting it may be difficult. In this case, loosen the screws slightly and then retighten them.

(6) If startup still is difficult after (5) above, check (1) to (3) again.

(7) Tightening the screws of the MA too much may give rise to cracks in the molded part of the MA (plastic part) and bend the mold into a bowed shape, making contact poor.

(8) After soldering the TC, do not perform cleaning by flux immersion or vapor.

2. 6 Connecting QB-78K0RKX3 to Target System

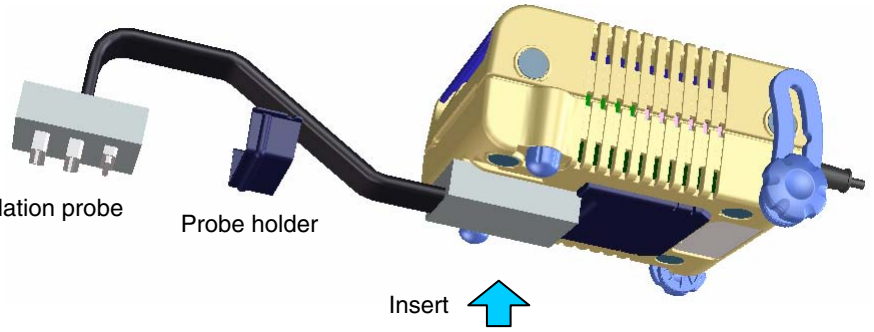
If connecting the emulation probe (QB-144-EP-02S), connect it to the QB-78K0RKX3 and the target system by the following procedure.

(a) Connecting probe holder

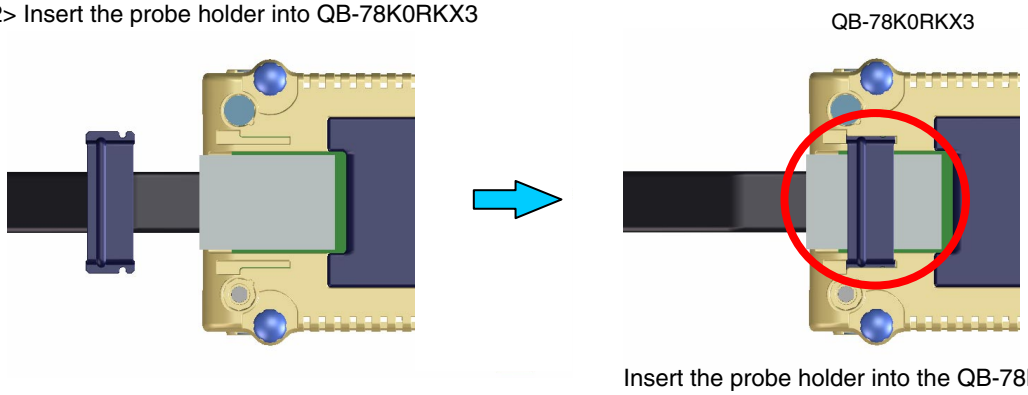
Use the probe holder (supplied with the QB-78K0RKX3) to connect the emulation probe to the QB-78K0RKX3, as shown below.

Figure 2-5. Using Probe Holder

<1> Connect the QB-78K0RKX3 to the probe.



<2> Insert the probe holder into QB-78K0RKX3



Insert the probe holder into the QB-78K0RKX3 until you hear a click (note the direction).

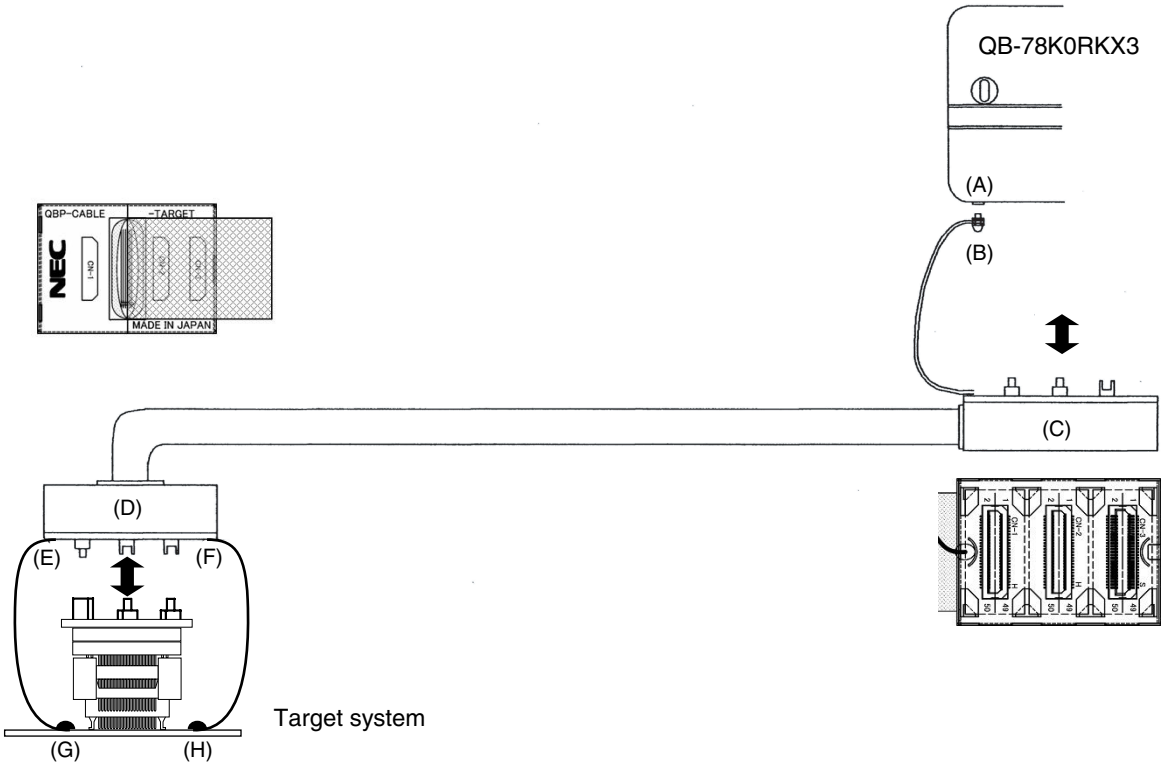
(b) Connection of emulation probe GND wire

There are three GND wires in the emulation probe. Connect them to the QB-78K0RKX3 and target system.

<1> Fasten the GND wire on the QB-78K0RKX3 side of the emulation probe to the nut on the bottom of the QB-78K0RKX3 using a #0 or #1 Phillips precision screwdriver (connection of B to A in **Figure 2-6**).

<2> Next insert the connector on the top of the emulation probe into the connector at the opening on the bottom of the QB-78K0RKX3 from below being careful of the insertion direction (connection of C in **Figure 2-6** to QB-78K0RKX3).

Figure 2-6. GND Wire



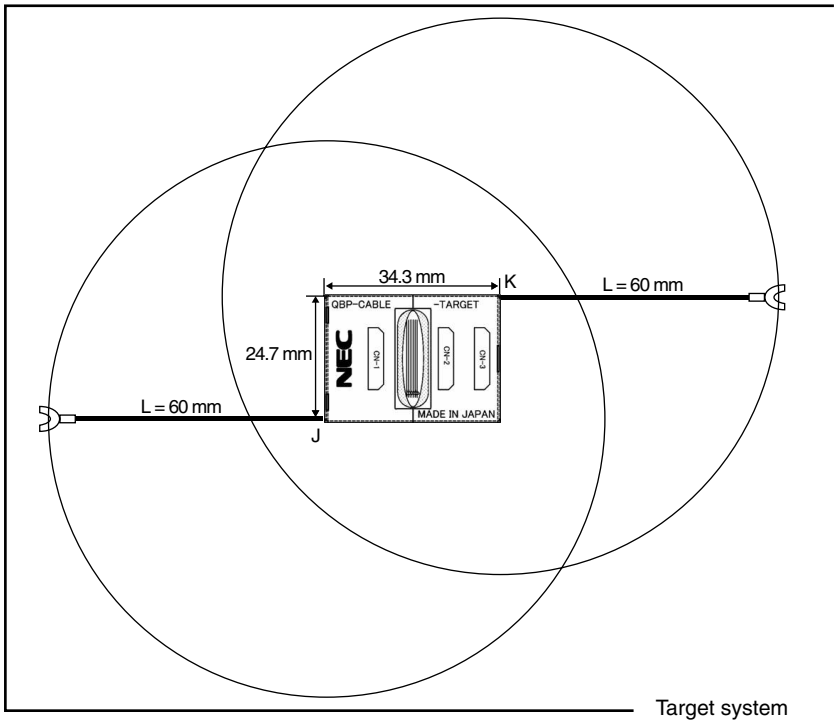
<3> Connect the exchange adapter and emulation probe to the target connector.

<4> Connect the two GND wires on the target system side of the emulation probe to the target system GND. If a pin or screw is fastened to the target system GND, remove the transparent terminal cover on the end of the GND wire and fasten the Y terminal of the GND wire to the target system (G in **Figure 2-6**). If the GND on the target system is an exposed pad, likewise fasten the Y terminal to the pad on the target system by soldering (H in **Figure 2-6**) (recommended soldering iron temperature setting: 300°C).

<5> If the target system has only one GND, connect only one of the GND wires of the emulation probe. Cut off the other GND wires with a nipper or leave it as is without removing the pin cover.

<6> Since the length of the GND wire below the head (insulated part) is approximately 60 mm, there must be at least a GND to which it can be connected to within the range of the two approximately 60 mm radius sections of the target system for connecting the emulation probe, as shown in **Figure 2-7**. The GND wire of the emulation probe is soldered to positions J and K in **Figure 2-7**.

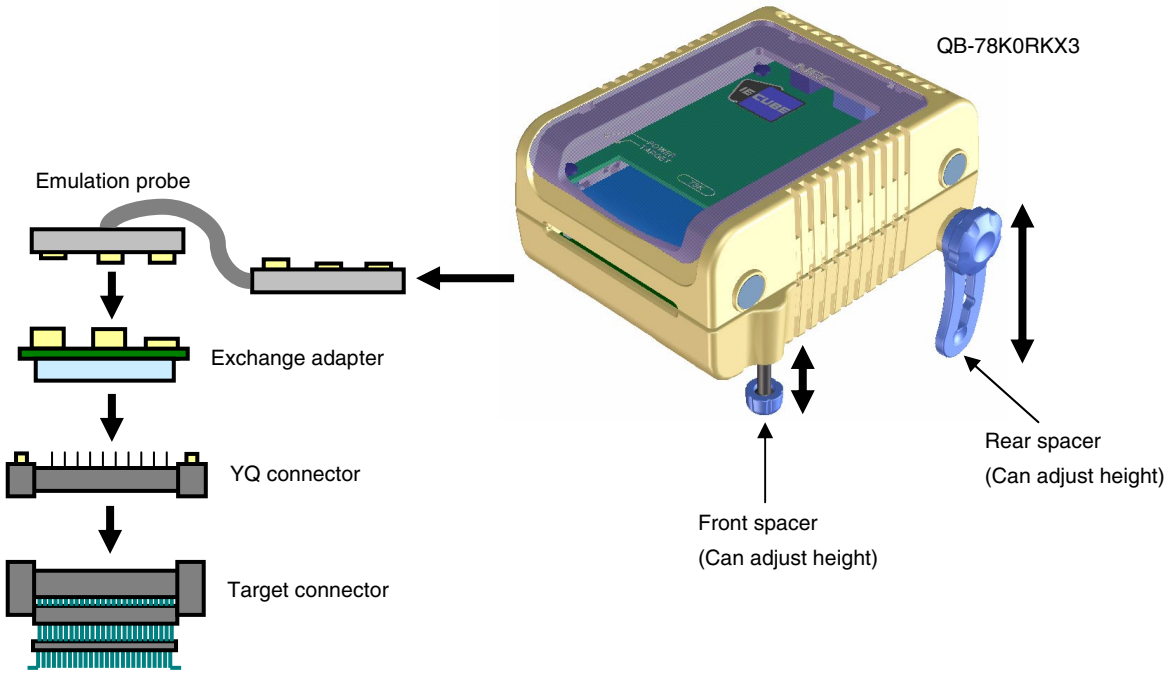
Figure 2-7. Where GND Wire Can Be Connected



(c) Ensuring isolation

When connecting the target system to the QB-78K0RKX3 using an emulation probe, perform height regulation using the front spacer or rear spacer of the QB-78K0RKX3 and ensure isolation from the target system.

Figure 2-8. Connection Using Emulation Probe



(d) Precautions related to emulation probe

<1> Be careful that stress of the emulation probe is not placed on the target connector. Moreover, when removing the emulation probe, remove it slowly while pressing down on the exchange adapter with a finger so that there is no stress on the target connector.

<2> Be sure to connect the GND wire of the emulation probe to the QB-78K0RKX3 and the target system. If it cannot be connected, the impedance of the cable is unstable and could bring about lowering of signal transmission characteristics or distortion of the output waveform for an input waveform.

2. 7 Notes on Power Supply and GND Pin Connection

For power supplies and GND pins of the target device, be sure to connect all pins to each power supply or GND.

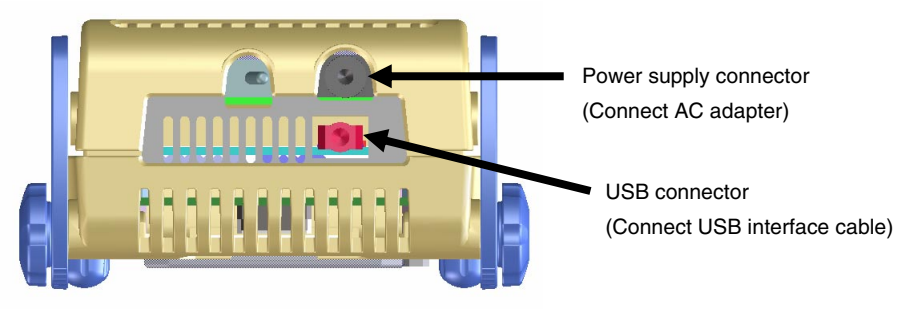
2. 8 Connecting USB Interface Cable and AC Adapter

Plug the USB interface cable supplied with the QB-78K0RKX3 into the USB connector of the host machine, and plug the other side into the USB connector on the rear of the QB-78K0RKX3.

Plug the AC adapter supplied with the QB-78K0RKX3 into a receptacle and plug the other side into the power supply connector on the rear of the QB-78K0RKX3.

For QB-78K0RKX3 connector positions, see **Figure 2-9**.

Figure 2-9. Connector Positions



2. 9 Switching Power On and Off

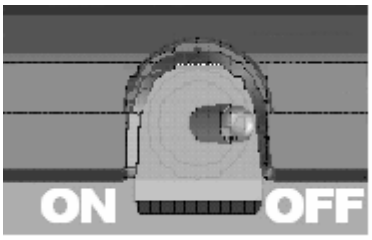
Be sure to switch the power on and off according to the following procedures.

- Switching power on	- Switching power off
<1> QB-78K0RKX3 power on	<1> Debugger termination
<2> Target system power on[Note]	<2> Target system power off[Note]
<3> Debugger startup	<3> QB-78K0RKX3 power off

Note In the procedures, <2> is unnecessary if the target system is not connected.

Caution If the wrong sequence was used for the operation, the target system or QB-78K0RKX3 may fail

Table 3-1. Settings at Shipment

Item	Setting	Remarks
OSC1	Not mounted	Oscillator can be mounted[Note].
Power switch		Set to OFF at shipment.

Note The oscillation circuit using an oscillation cannot be used.

<R>

CHAPTER 4 CAUTIONS

○ Target system voltage during a break

Do not decrease the voltage of the target system during a break.

A reset that is generated by the low-voltage detector (LVI) or by power-on-clear (POC) during a break may cause an incorrect operation of the debugger or communication errors.

○ Flash self programming emulation

<1> Deleting and writing will operate normally even if initialize function “FlashEnv” is used to set the CPU frequency to a setting different from the actual operating frequency.

<2> Writing can be performed normally even for an area that has not been deleted.

○ Port pull-up resistor option register

The time until a pull-up resistor becomes valid after it has been set so by using the port pull-up resistor option register (PUx) differs from the device.

Device: Valid after 2 clocks, after setting

QB-78K0RKX3: Valid after about 150 ns, after setting

○ Input port functions

The input port characteristics of P62 and P63 differ from the device.

Table 4-1. The input port characteristics of P62 and P63

Parameter		Conditions	MIN.	MAX.	Unit
Device	High level input voltage (V_{IH})	1.8 V ≤ V_{DD} < 5.5 V	0.7 V_{DD}	6.0	V
	Low level input voltage (V_{IL})	1.8 V ≤ V_{DD} < 5.5 V	0	0.3 V_{DD}	V
QB-78K0RKX3	High level input voltage (V_{IH})	2.7 V ≤ V_{DD} ≤ 5.5 V	0.8 V_{DD}	5.5	V
		1.8 V ≤ V_{DD} < 2.7 V	0.85 V_{DD}	5.5	V
	Low level input voltage (V_{IL})	2.7 V ≤ V_{DD} ≤ 5.5 V	0	0.3 V_{DD}	V
		1.8 V ≤ V_{DD} < 2.7 V	0	0.2 V_{DD}	V

Remark Device : CMOS input

QB-78K0RKX3 : Schmitt input

○ ANI pin characteristics

If a series resistor has been inserted into the ANI pin, the voltage drop becomes larger and the A/D conversion value becomes lower than the device.

Example: If a 10 kΩ series resistor has been connected to the ANI pin and 5.5 V have been input, the voltage drops to 5.3 V.

○ D/A converter function

The time required to perform D/A conversion by using the D/A converter function differs from the device.

Device: Maximum conversion time during 1.8 V ≤ V_{DD} < 2.7 V operation: 3 μs

Maximum conversion time during 2.7 V ≤ V_{DD} ≤ 5.5 V operation: 6 μs

QB-78K0RKX3: Average conversion time during 1.8 V ≤ V_{DD} ≤ 5.5 V operation: 6 μs

○ Internal high-speed oscillator trimming register (HIOTRM)

Emulating the internal high-speed oscillator trimming register (HIOTRM) is not supported.

The internal high-speed oscillator operates at 8 MHz (±1%), regardless of the setting of HIOTRM.

○ Device restrictions

With respect to the device restrictions, the operation of the emulator differs from that of the device, because the following items do not correspond to all control symbols with the QB-78K0RKX3.

See **Internal high-speed oscillator trimming register (HIOTRM)**, above, for the internal high-speed oscillator trimming register (HIOTRM).

- Restriction related to temperature correction of the 8 MHz internal high-speed oscillator
- Restriction related to low-voltage operation of the A/D converter
- Restriction imposed due to a conflict of instructions associated with DMA transfer operations and RAM value read operations

APPENDIX A CHARACTERISTICS OF TARGET INTERFACE

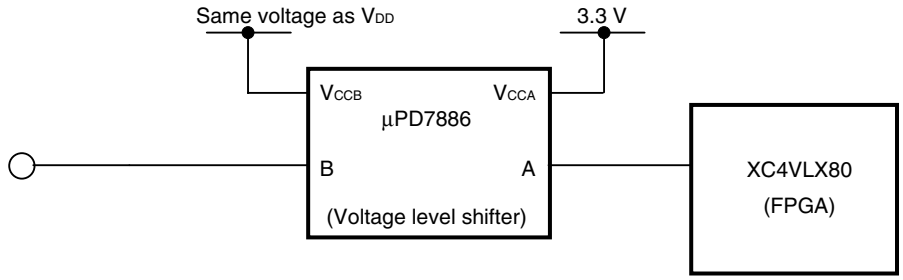
The target interface (signals connecting the in-circuit emulator and target system) operate, in terms of function, as if an actual device were connected. The characteristics, however, may be different from those of the actual device.

The target interface of this product is one of the following shown in **Figure A-1**. **Table A-1** shows the processing of each target interface.

Figure A-1. Equivalent Circuit of Target Interface (1/6)

- Target system side - QB-78K0RKX3 side

Equivalent circuit A



Equivalent circuit B

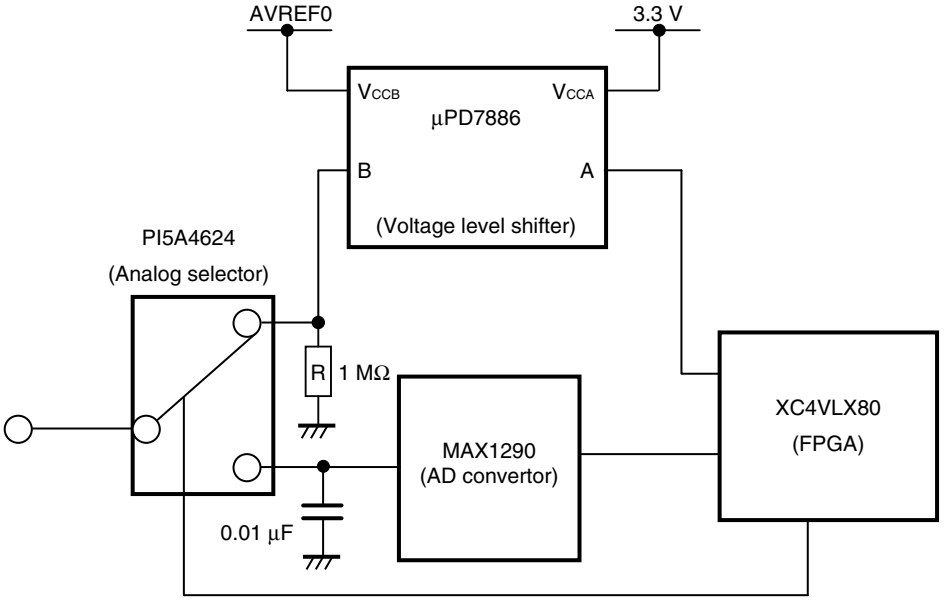
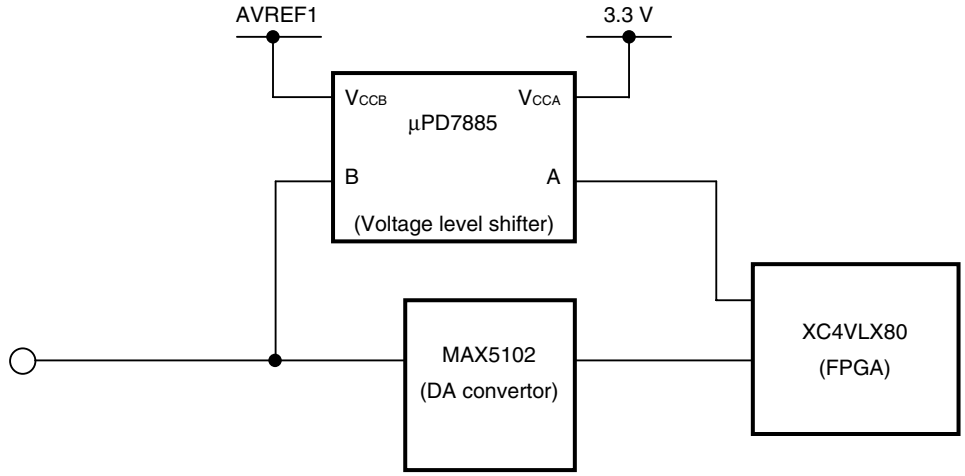


Figure A-1. Equivalent Circuit of Target Interface (2/6)

- Target system side - QB-78K0RKX3 side

Equivalent circuit C



Equivalent circuit D

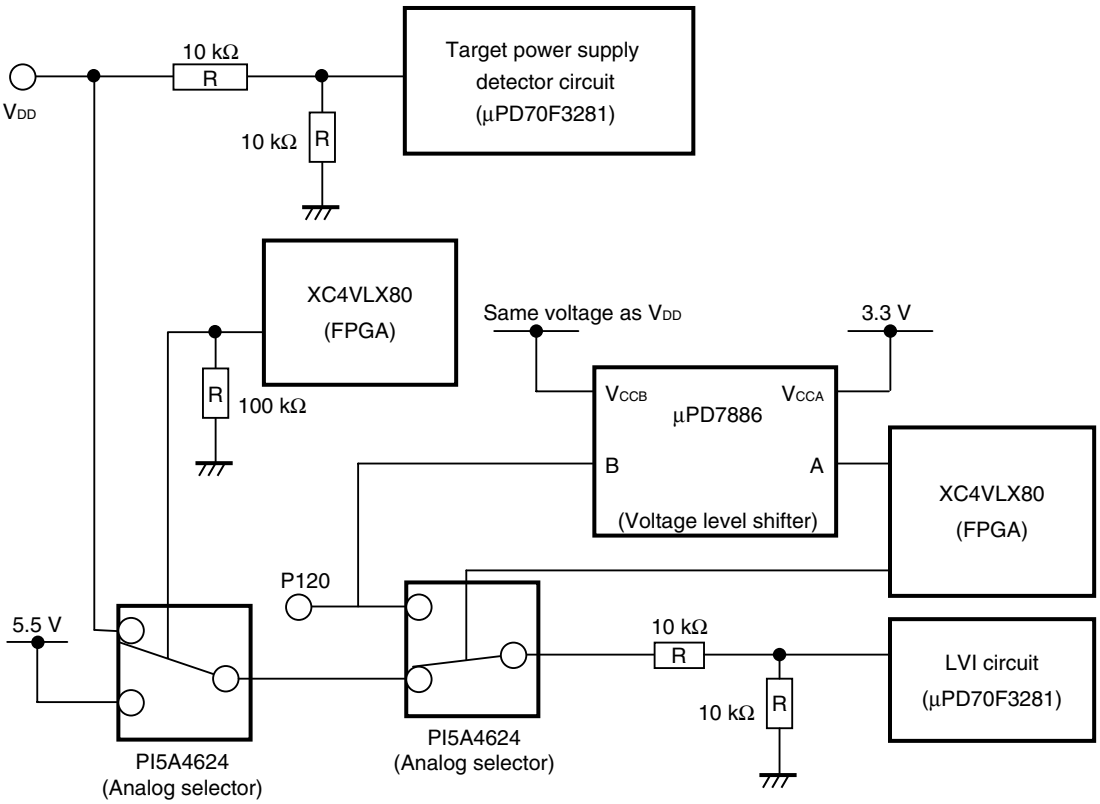
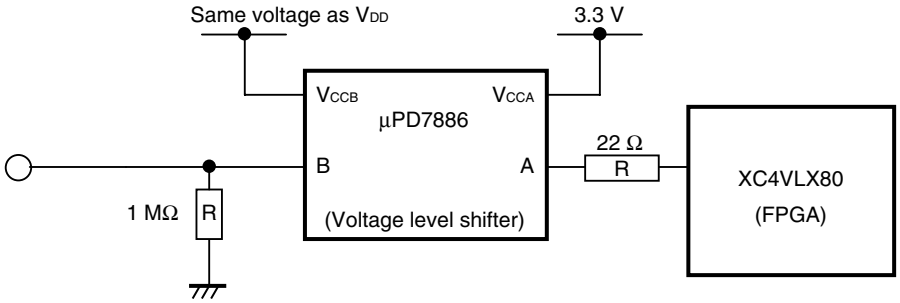


Figure A-1. Equivalent Circuit of Target Interface (3/6)

- Target system side - QB-78K0RKX3 side

Equivalent circuit E



Equivalent circuit F

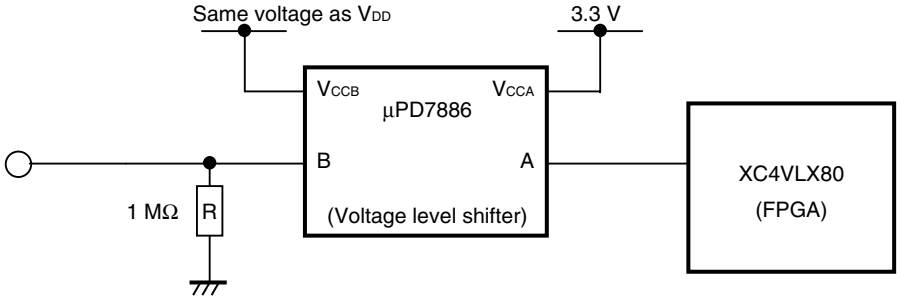
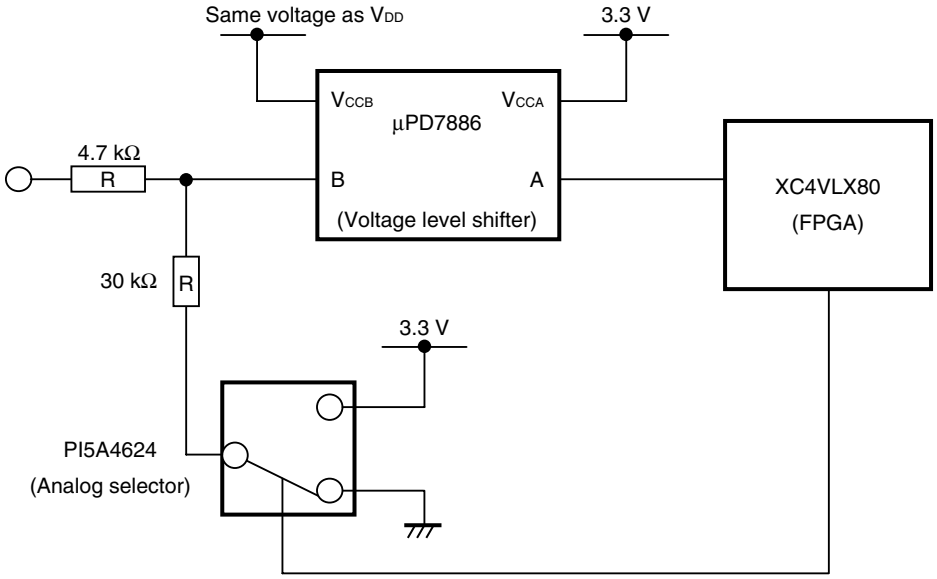


Figure A-1. Equivalent Circuit of Target Interface (4/6)

- Target system side - QB-78K0RKX3 side

Equivalent circuit G



Equivalent circuit H

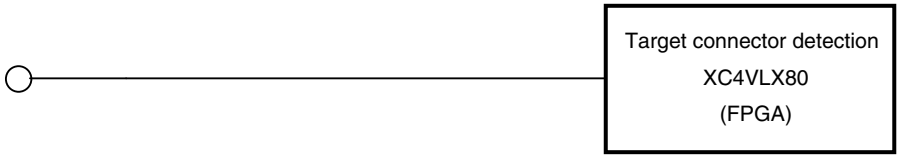
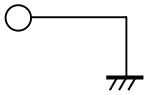


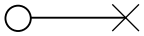
Figure A-1. Equivalent Circuit of Target Interface (5/6)

- Target system side - QB-78K0RKX3 side

Equivalent circuit I



Equivalent circuit J

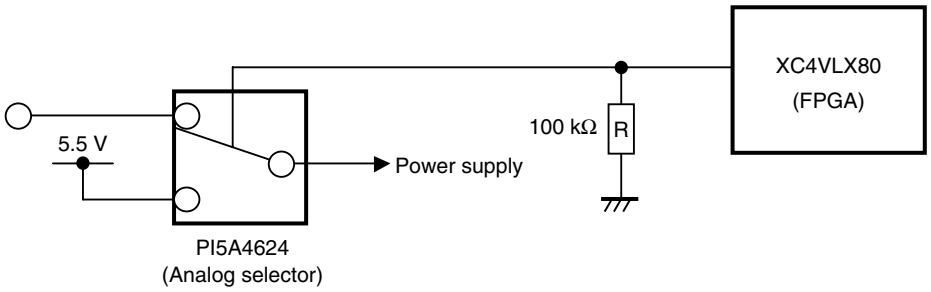


Open

Figure A-1. Equivalent Circuit of Target Interface (6/6)

- Target system side - QB-78K0RKX3 side

Equivalent circuit K



Equivalent circuit L

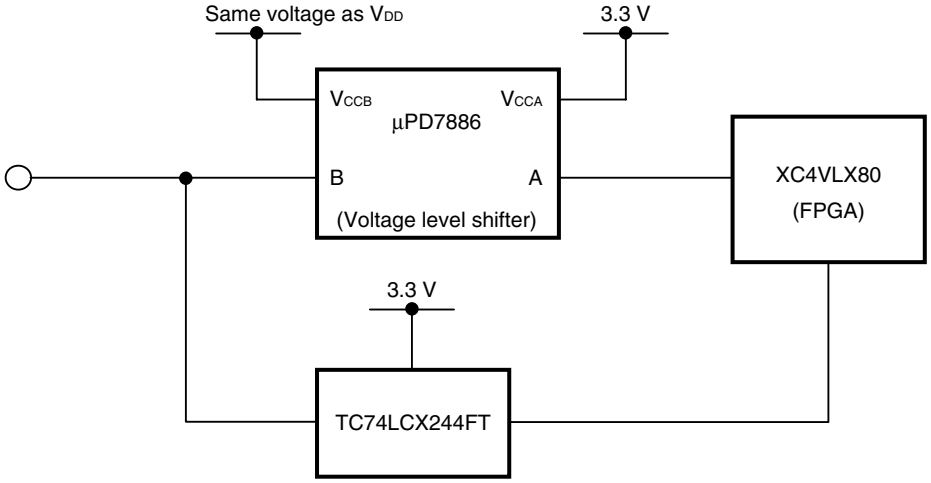


Table A-1. Target Interface Combinations (1/14)

KE3 (64GB/64GK) Pin Number	Pin Name in Target Device (78K0R/KX3)	Equivalent Circuit
1	P120/INTP0/EXLVI	D
2	P43/$\overline{\text{SCK01}}$	L
3	P42/TI04/TO04	A
4	P41/TOOL1	A
5	P40/TOOL0	A
6	$\overline{\text{RESET}}$	F
7	P124/XT2/EXCLKS	E
8	P123/XT1	A
9	FLMD0	G
10	P122/X2/EXCLK	E
11	P121/X1	A
12	REGC	J
13	V_{SS}	H
14	EV_{SS}	I
15	V_{DD}	D
16	EV_{DD}	D
17	P60/SCL0	A
18	P61/SDA0	A
19	P62	A
20	P63	A
21	P31/TI03/TO03/INTP4	A
22	P77/KR7/INTP11	A
23	P76/KR6/INTP10	A
24	P75/KR5/INTP9	A
25	P74/KR4/INTP8	A
26	P73/KR3	A
27	P72/KR2	A
28	P71/KR1	A
29	P70/KR0	A
30	P06/TI06/TO06	A
31	P05/TI05/TO05	A
32	P30/INTP3/RTC1HZ	A

Table A-1. Target Interface Combinations (2/14)

KE3 (64GB/64GK) Pin Number	Pin Name in Target Device (78K0R/KX3)	Equivalent Circuit
33	P50/INTP1	A
34	P51/INTP2	A
35	P52	A
36	P53	A
37	P54	A
38	P55	A
39	P17/TI02/TO02	A
40	P16/TI01/TO01/INTP5	A
41	P15/RTCDIV/RTCCL	A
42	P14/RXD3	A
43	P13/TXD3	A
44	P12/SO00/TXD0	A
45	P11/SI00/RXD0	A
46	P10/$\overline{\text{SCK00}}$	A
47	AV_{REF0}	K
48	AV_{SS}	I
49	P27/ANI7	B
50	P26/ANI6	B
51	P25/ANI5	B
52	P24/ANI4	B
53	P23/ANI3	B
54	P22/ANI2	B
55	P21/ANI1	B
56	P20/ANI0	B
57	P130	A
58	P04/$\overline{\text{SCK10}}$/SCL10	L
59	P03/SI10/RXD1/SDA10	L
60	P02/SO10/TXD1	A
61	P01/TO00	A
62	P00/TI00	A
63	P141/PCLBUZ1/INTP7	A
64	P140/PCLBUZ0/INTP6	A

Table A-1. Target Interface Combinations (3/14)

KF3 (80GC/80GK) Pin Number	Pin Name in Target Device (78K0R/KX3)	Equivalent Circuit
1	P120/INTP0/EXLVI	D
2	P47	A
3	P46	A
4	P45/SO01	A
5	P44/SI01	L
6	P43/$\overline{\text{SCK01}}$	L
7	P42/TI04/TO04	A
8	P41/TOOL1	A
9	P40/TOOL0	A
10	$\overline{\text{RESET}}$	F
11	P124/XT2/EXCLKS	E
12	P123/XT1	A
13	FLMD0	G
14	P122/X2/EXCLK	E
15	P121/X1	A
16	REGC	J
17	V_{SS}	H
18	EV_{SS}	I
19	V_{DD}	D
20	EV_{DD}	D
21	P60/SCL0	A
22	P61/SDA0	A
23	P62	A
24	P63	A
25	P31/TI03/TO03/INTP4	A
26	P64	A
27	P65	A
28	P66	A
29	P67	A
30	P77/KR7/INTP11	A
31	P76/KR6/INTP10	A
32	P75/KR5/INTP9	A
33	P74/KR4/INTP8	A
34	P73/KR3	A
35	P72/KR2	A
36	P71/KR1	A
37	P70/KR0	A
38	P06/TI06/TO06	A
39	P05/TI05/TO05	A
40	P30/INTP3/RTC1HZ	A

Table A-1. Target Interface Combinations (4/14)

KF3 (80GC/80GK) Pin Number	Pin Name in Target Device (78K0R/KX3)	Equivalent Circuit
41	P50/INTP1	A
42	P51/INTP2	A
43	P52	A
44	P53	A
45	P54	A
46	P55	A
47	P17/TI02/TO02	A
48	P16/TI01/TO01/INTP5	A
49	P15/RTCDIV/RTCCL	A
50	P14/RXD3	A
51	P13/TXD3	A
52	P12/SO00/TXD0	A
53	P11/SI00/RXD0	A
54	P10/$\overline{\text{SCK00}}$	A
56	AV_{REF1}	K
57	P110/ANO0	C
58	P111/ANO1	C
59	AV_{REF0}	K
60	AV_{SS}	I
61	P27/ANI7	B
62	P26/ANI6	B
63	P25/ANI5	B
64	P24/ANI4	B
65	P23/ANI3	B
66	P22/ANI2	B
67	P21/ANI1	B
68	P20/ANI0	B
69	P130	A
70	P04/$\overline{\text{SCK10}}$/SCL10	L
71	P03/SI10/RXD1/SDA10	L
72	P02/SO10/TXD1	A
73	P01/TO00	A
74	P00/TI00	A
75	P145/TI07/TO07	A
76	P144/SO20/TXD2	A
77	P143/SI20/RXD2/SDA20	L
78	P142/$\overline{\text{SCK20}}$/SCL20	L
79	P141/PCLBUZ1/INTP7	A
80	P140/PCLBUZ0/INTP6	A

Table A-1. Target Interface Combinations (5/14)

KG3 (100GC) Pin Number	Pin Name in Target Device (78K0R/KX3)	Equivalent Circuit
1	P142/$\overline{\text{SCK20}}$/SCL20	L
2	P141/PCLBUZ1/INTP7	A
3	P140/PCLBUZ0/INTP6	A
4	P120/INTP0/EXLVI	D
5	P47/INTP2	A
6	P46/INTP1/TI05/TO05	A
7	P45/SO01	A
8	P44/SI01	L
9	P43/$\overline{\text{SCK01}}$	L
10	P42/TI04/TO04	A
11	P41/TOOL1	A
12	P40/TOOL0	A
13	$\overline{\text{RESET}}$	F
14	P124/XT2/EXCLKS	E
15	P123/XT1	A
16	FLMD0	G
17	P122/X2/EXCLK	E
18	P121/X1	A
19	REGC	J
20	V_{SS}	H
21	EV_{SS}	I
22	V_{DD}	D
23	EV_{DD}	D
24	P60/SCL0	A
25	P61/SDA0	A
26	P62	A
27	P63	A
28	P31/TI03/TO03/INTP4	A
29	P64/$\overline{\text{RD}}$	A
30	P65/$\overline{\text{WR0}}$	A
31	P66/$\overline{\text{WR1}}$	A
32	P67/ASTB	A
33	P77/EX23/KR7/INTP11	A
34	P76/EX22/KR6/INTP10	A
35	P75/EX21/KR5/INTP9	A
36	P74/EX20/KR4/INTP8	A
37	P73/EX19/KR3	A
38	P72/EX18/KR2	A
39	P71/EX17/KR1	A
40	P70/EX16/KR0	A
41	P06/$\overline{\text{WAIT}}$	A
42	P05/CLKOUT	A
43	EV_{SS}	I
44	P80/EX0	A
45	P81/EX1	A
46	P82/EX2	A
47	P83/EX3	A
48	P84/EX4	A
49	P85/EX5	A
50	P86/EX6	A

Table A-1. Target Interface Combinations (6/14)

KG3 (100GC) Pin Number	Pin Name in Target Device (78K0R/KX3)	Equivalent Circuit
51	P87/EX7	A
52	P30/INTP3/RTC1HZ	A
53	EV_{DD}	D
54	P50/EX8	A
55	P51/EX9	A
56	P52/EX10	A
57	P53/EX11	A
58	P54/EX12	A
59	P55/EX13	A
60	P56/EX14	A
61	P57/EX15	A
62	P17/EX31/TI02/TO02	A
63	P16/EX30/TI01/TO01/INTP5	A
64	P15/EX29/RTCDIV/RTCCL	A
65	P14/EX28/RXD3	A
66	P13/EX27/TXD3	A
67	P12/EX26/SO00/TXD0	A
68	P11/EX25/SI00/RXD0	A
69	P10/EX24/$\overline{SCK00}$	A
70	AV_{REF1}	K
71	P110/ANO0	C
72	P111/ANO1	C
73	AV_{REF0}	K
74	AV_{SS}	I
75	P157/ANI15	B
76	P156/ANI14	B
77	P155/ANI13	B
78	P154/ANI12	B
79	P153/ANI11	B
80	P152/ANI10	B
81	P151/ANI9	B
82	P150/ANI8	B
83	P27/ANI7	B
84	P26/ANI6	B
85	P25/ANI5	B
86	P24/ANI4	B
87	P23/ANI3	B
88	P22/ANI2	B
89	P21/ANI1	B
90	P20/ANI0	B
91	P130	A
92	P131/TI06/TO06	A
93	P04/$\overline{SCK10}$/SCL10	L
94	P03/SI10/RXD1/SDA10	L
95	P02/SO10/TXD1	A
96	P01/TO00	A
97	P00/TI00	A
98	P145/TI07/TO07	A
99	P144/SO20/TXD2	A
100	P143/SI20/RXD2/SDA20	L

Table A-1. Target Interface Combinations (7/14)

KG3 (100GF) Pin Number	Pin Name in Target Device (78K0R/KX3)	Equivalent Circuit
1	P60/SCL0	A
2	P61/SDA0	A
3	P62	A
4	P63	A
5	P31/TI03/TO03/INTP4	A
6	P64/$\overline{RD}$	A
7	P65/$\overline{WR0}$	A
8	P66/$\overline{WR1}$	A
9	P67/ASTB	A
10	P77/EX23/KR7/INTP11	A
11	P76/EX22/KR6/INTP10	A
12	P75/EX21/KR5/INTP9	A
13	P74/EX20/KR4/INTP8	A
14	P73/EX19/KR3	A
15	P72/EX18/KR2	A
16	P71/EX17/KR1	A
17	P70/EX16/KR0	A
18	P06/$\overline{WAIT}$	A
19	P05/CLKOUT	A
20	EV_{SS}	I
21	P80/EX0	A
22	P81/EX1	A
23	P82/EX2	A
24	P83/EX3	A
25	P84/EX4	A
26	P85/EX5	A
27	P86/EX6	A
28	P87/EX7	A
29	P30/INTP3/RTC1HZ	A
30	EV_{DD}	D
31	P50/EX8	A
32	P51/EX9	A
33	P52/EX10	A
34	P53/EX11	A
35	P54/EX12	A
36	P55/EX13	A
37	P56/EX14	A
38	P57/EX15	A
39	P17/EX31/TI02/TO02	A
40	P16/EX30/TI01/TO01/INTP5	A
41	P15/EX29/RTCDIV/RTCCL	A
42	P14/EX28/RXD3	A
43	P13/EX27/TXD3	A
44	P12/EX26/SO00/TXD0	A
45	P11/EX25/SI00/RXD0	A
46	P10/EX24/$\overline{SCK00}$	A
47	AV_{REF1}	K
48	P110/ANO0	C
49	P111/ANO1	C
50	AV_{REF0}	K

Table A-1. Target Interface Combinations (8/14)

KG3 (100GF) Pin Number	Pin Name in Target Device (78K0R/KX3)	Equivalent Circuit
51	AV_{SS}	I
52	P157/ANI15	B
53	P156/ANI14	B
54	P155/ANI13	B
55	P154/ANI12	B
56	P153/ANI11	B
57	P152/ANI10	B
58	P151/ANI9	B
59	P150/ANI8	B
60	P27/ANI7	B
61	P26/ANI6	B
62	P25/ANI5	B
63	P24/ANI4	B
64	P23/ANI3	B
65	P22/ANI2	B
66	P21/ANI1	B
67	P20/ANI0	B
68	P130	A
69	P131/TI06/TO06	A
70	P04/$\overline{SCK10}$/SCL10	L
71	P03/SI10/RXD1/SDA10	L
72	P02/SO10/TXD1	A
73	P01/TO00	A
74	P00/TI00	A
75	P145/TI07/TO07	A
76	P144/SO20/TXD2	A
77	P143/SI20/RXD2/SDA20	L
78	P142/$\overline{SCK20}$/SCL20	L
79	P141/PCLBUZ1/INTP7	A
80	P140/PCLBUZ0/INTP6	A
81	P120/INTP0/EXLVI	D
82	P47/INTP2	A
83	P46/INTP1/TI05/TO05	A
84	P45/SO01	A
85	P44/SI01	L
86	P43/$\overline{SCK01}$	L
87	P42/TI04/TO04	A
88	P41/TOOL1	A
89	P40/TOOL0	A
90	$\overline{RESET}$	F
91	P124/XT2/EXCLKS	E
92	P123/XT1	A
93	FLMD0	G
94	P122/X2/EXCLK	E
95	P121/X1	A
96	REGC	J
97	V_{SS}	H
98	EV_{SS}	I
99	V_{DD}	D
100	EV_{DD}	D

Table A-1. Target Interface Combinations (9/14)

KH3 (128GF) Pin Number	Pin Name in Target Device (78K0R/KX3)	Equivalent Circuit
1	P142/$\overline{\text{SCK20}}$/SCL20	L
2	P141/PCLBUZ1/INTP7	A
3	P140/PCLBUZ0/INTP6	A
4	P120/INTP0/EXLVI	D
5	P37	A
6	P36	A
7	P35	A
8	P34	A
9	P33	A
10	P32	A
11	P163/TI13/TO13	A
12	P162/TI12/TO12	A
13	P161/TI11/TO11	A
14	P160/TI10/TO10	A
15	P47/INTP2	A
16	P46/INTP1/TI05/TO05	A
17	P45/SO01	A
18	P44/SI01	L
19	P43/$\overline{\text{SCK01}}$	L
20	P42/TI04/TO04	A
21	P41/TOOL1	A
22	P40/TOOL0	A
23	P127/SO21	A
24	P126/SI21/SDA21	L
25	P125/$\overline{\text{SCK21}}$/SCL21	L
26	RESINB	F
27	P124/XT2/EXCLKS	E
28	P123/XT1	A
29	FLMD0/VPPTS1	G
30	P122/X2/EXCLK	E
31	P121/X1	A
32	REGC	J
33	V_{SS}	H
34	EV_{SS0}	I
35	V_{DD}	D
36	EV_{DD0}	D
37	P60/SCL0	A
38	P61/SDA0	A
39	P62	A
40	P63	A
41	P31/TI03/TO03/INTP4	A
42	P64/$\overline{\text{RD}}$	A
43	P65/$\overline{\text{WR0}}$	A
44	P66/$\overline{\text{WR1}}$	A
45	P67/ASTB	A
46	P77/EX23/KR7/INTP11	A
47	P76/EX22/KR6/INTP10	A
48	P75/EX21/KR5/INTP9	A
49	P74/EX20/KR4/INTP8	A
50	P73/EX19/KR3	A

Table A-1. Target Interface Combinations (10/14)

KH3 (128GF) Pin Number	Pin Name in Target Device (78K0R/KX3)	Equivalent Circuit
51	P72/EX18/KR2	A
52	P71/EX17/KR1	A
53	P70/EX16/KR0	A
54	P06/$\overline{\text{WAIT}}$	A
55	P05/CLKOUT	A
56	EV_{SS1}	I
57	EV_{DD1E}	D
58	P80/EX0	A
59	P81/EX1	A
60	P82/EX2	A
61	P83/EX3	A
62	P84/EX4	A
63	P85/EX5	A
64	P86/EX6	A
65	P87/EX7	A
66	P30/INTP3/RTC1HZ	A
67	P50/EX8	A
68	P51/EX9	A
69	P52/EX10	A
70	P53/EX11	A
71	P54/EX12	A
72	P55/EX13	A
73	P56/EX14	A
74	P57/EX15	A
75	P17/EX31/TI02	A
76	P16/EX30/TI01	A
77	P15/EX29/RTCDIV	A
78	P14/EX28/RXD3	A
79	P13/EX27/TXD3	A
80	P12/EX26/SO00	A
81	P11/EX25/SI00	A
82	P10/EX24/$\overline{\text{SCK00}}$	A
83	P90/EX32	A
84	P91/EX33	A
85	P92/EX34	A
86	P93/EX35	A
87	P94	A
88	P95/$\overline{\text{SCK11}}$	L
89	P96/SI11/SDA11	L
90	P97/SO11	A
91	P112	A
92	P113	A
93	P114	A
94	P115	A
95	P116	A
96	P117	A
97	AV_{REF1}	K
98	P110/ANO0	C
99	P111/ANO1	C
100	AV_{REF0}	K

Table A-1. Target Interface Combinations (11/14)

KH3 (128GF) Pin Number	Pin Name in Target Device (78K0R/KX3)	Equivalent Circuit
101	AV_{SS0}	I
102	P157/ANI15	B
103	P156/ANI14	B
104	P155/ANI13	B
105	P154/ANI12	B
106	P153/ANI11	B
107	P152/ANI10	B
108	P151/ANI9	B
109	P150/ANI8	B
110	P27/ANI7	B
111	P26/ANI6	B
112	P25/ANI5	B
113	P24/ANI4	B
114	P23/ANI3	B
115	P22/ANI2	B
116	P21/ANI1	B
117	P20/ANI0	B
118	P130	A
119	P131/TI06/TO06	A
120	P07	A
121	P04/$\overline{SCK10}$/SCL10	L
122	P03/SI10/RXD1/SDA10	L
123	P02/SO10/TXD1	A
124	P01/TO00	A
125	P00/TI00	A
126	P145/TI07/TO07	A
127	P144/SO20/TXD2	A
128	P143/SI20/RXD2/SDA20	L

Table A-1. Target Interface Combinations (12/14)

KJ3 (144GJ) Pin Number	Pin Name in Target Device (78K0R/KX3)	Equivalent Circuit
1	P141/PCLBUZ1/INTP7	A
2	P140/PCLBUZ0/INTP6	A
3	P120/INTP0/EXLVI	D
4	P37	A
5	P36	A
6	P35	A
7	P34	A
8	P33	A
9	P32	A
10	P163/TI13/TO13	A
11	P162/TI12/TO12	A
12	P161/TI11/TO11	A
13	P160/TI10/TO10	A
14	P47/INTP2	A
15	P46/INTP1/TI05/TO05	A
16	P45/SO01	A
17	P44/SI01	L
18	P43/$\overline{\text{SCK01}}$	L
19	P42/TI04/TO04	A
20	P41/TOOL1	A
21	P40/TOOL0	A
22	P127/SO21	A
23	P126/SI21/SDA21	L
24	P125/$\overline{\text{SCK21}}$/SCL21	L
25	RESINB	F
26	P124/XT2/EXCLKS	E
27	P123/XT1	A
28	FLMD0/VPPTS1	G
29	P122/X2/EXCLK	E
30	P121/X1	A
31	REGC	J
32	V_{SS}	H
33	EV_{SS0}	I
34	V_{DD}	D
35	EV_{DD0}	D
36	P60/SCL0	A
37	P61/SDA0	A
38	P62	A
39	P63	A
40	P100	A
41	P101	A
42	P102	A
43	P103	A
44	P104	A
45	P105	A
46	P106	A
47	P107	A
48	P31/TI03/TO03/INTP4	A
49	P64/$\overline{\text{RD}}$	A
50	P65/$\overline{\text{WR0}}$	A

Table A-1. Target Interface Combinations (13/14)

KJ3 (144GJ) Pin Number	Pin Name in Target Device (78K0R/KX3)	Equivalent Circuit
51	P66/$\overline{WR1}$	A
52	P67/ASTB	A
53	P77/EX23/KR7/INTP11	A
54	P76/EX22/KR6/INTP10	A
55	P75/EX21/KR5/INTP9	A
56	P74/EX20/KR4/INTP8	A
57	P73/EX19/KR3	A
58	P72/EX18/KR2	A
59	P71/EX17/KR1	A
60	P70/EX16/KR0	A
61	P06/$\overline{WAIT}$	A
62	P05/CLKOUT	A
63	EV_{SS1}	I
64	EV_{DD1E}	D
65	P80/EX0	A
66	P81/EX1	A
67	P82/EX2	A
68	P83/EX3	A
69	P84/EX4	A
70	P85/EX5	A
71	P86/EX6	A
72	P87/EX7	A
73	P30/INTP3/RTC1HZ	A
74	P50/EX8	A
75	P51/EX9	A
76	P52/EX10	A
77	P53/EX11	A
78	P54/EX12	A
79	P55/EX13	A
80	P56/EX14	A
81	P57/EX15	A
82	P17/EX31/TI02/TO02	A
83	P16/EX30/TI01/TO01/INTP5	A
84	P15/EX29/RTCDIV/RTCCL	A
85	P14/EX28/RXD3	A
86	P13/EX27/TXD3	A
87	P12/EX26/SO00/TXD0	A
88	P11/EX25/SI00/RXD0	A
89	P10/EX24/$\overline{SCK00}$	A
90	P90/EX32	A
91	P91/EX33	A
92	P92/EX34	A
93	P93/EX35	A
94	P94	A
95	P95/$\overline{SCK11}$/SCL11	L
96	P96/SI11/SDA11	L
97	P97/SO11	A
98	P112	A
99	P113	A
100	P114	A

Table A-1. Target Interface Combinations (14/14)

KJ3 (144GJ) Pin Number	Pin Name in Target Device (78K0R/KX3)	Equivalent Circuit
101	P115	A
102	P116	A
103	P117	A
104	AV_{REF1}	K
105	P110/ANO0	C
106	P111/ANO1	C
107	AV_{REF0}	K
108	AV_{SS0}	I
109	P157/ANI15	B
110	P156/ANI14	B
111	P155/ANI13	B
112	P154/ANI12	B
113	P153/ANI11	B
114	P152/ANI10	B
115	P151/ANI9	B
116	P150/ANI8	B
117	P27/ANI7	B
118	P26/ANI6	B
119	P25/ANI5	B
120	P24/ANI4	B
121	P23/ANI3	B
122	P22/ANI2	B
123	P21/ANI1	B
124	P20/ANI0	B
125	P130	A
126	P131/TI06/TO06	A
127	P132	A
128	P133	A
129	P134	A
130	P135	A
131	P136	A
132	P137	A
133	P07	A
134	P04/$\overline{SCK10}$/SCL10	L
135	P03/SI10/RXD1/SDA10	L
136	P02/SO10/TXD1	A
137	P01/TO00	A
138	P00/TI00	A
139	P147	A
140	P146	A
141	P145/TI07/TO07	A
142	P144/SO20/TXD2	A
143	P143/SI20/RXD2/SDA20	L
144	P142/$\overline{SCK20}$/SCL20	L

<R>

APPENDIX B REVISION HISTORY

B.1 Major Revisions in This Edition

Page	Description
INTRODUCTION	
p.7	Change of Documents Related to Development Tools (User's Manuals)
CHAPTER 1 GENERAL	
p. 10	Change of the value target system power supply in Power consumption description in **Table 1-1. QB-78K0RKX3 Hardware Specifications** Current: approx. 17 mA MAX.→ approx. 4.1 mA MAX.
p.13	Deletion of descriptions "sold separately" and **Notes** in **Table 1-3. Adapters and Connectors for Each Target Device, Table 1-4. Common Probe and Adapter** Change of decription
p. 14	Change of descriptions in **1.5 Package Contents**
CHAPTER 2 SETUP PROCEDURE	
p.20	Change of description in **2. 3 Clock Settings**
p.25	Change of description in **2.5.2 Mounting YQ to TC**
CHAPTER 4 CAUTIONS	
p. 33 to 34	Addition of **CHAPTER 4 CAUTIONS**
APPENDIX B REVISION HISTORY	
p. 55	Updating of description

B.2 Revision History of Preceding Editions

Edition	Major Revision from Previous Edition	Applied to:
3rd edition	Addition of 78K0R/KH3 and 78K0R/KJ3 to target devices	throughout
	Change of description in **1.3 System Configuration**	**CHAPTER 1 GENERAL**
	Change of description of <1> Host machine in **Figure 1-1. System Configuration**	
	Addition of 78K0R/KH3 and 78K0R/KJ3 in and addition of description in Note 1 of **Table 1-3. Adapters and Connectors for Each Target Device**	
	Addition of description in **1.5 Package Contents**	
	Addition of KH3 and KJ3 in **Table A-1. Target Interface Combinations**	**APPENDIX A CHARACTERISTICS OF TARGET INTERFACE**
	Addition of **APPENDIX B REVISION HISTORY**	**APPENDIX B REVISION HISTORY**
2nd edition	Addition of 78K0R/KE3 to target devices	throughout
	Table 1-1. QB-78K0RKX3 Hardware Specifications • Change of power consumption (AC adapter for QB-78K0RKX3) • Change of figure	**CHAPTER 1 GENERAL**
	Change of **Table 1-2. QB-78K0RKX3 System Specifications**	
	Change of **Figure 1-1. System Configuration**	
	Deletion of **1.3 Target Devices**	
	1.4 System Configuration for Each Target Device • Change of **Note 1** • Change of **Remark**	
	Change of description in **1.5 Package Contents**	
	Change of **Figure 2-1. Names of Parts of QB-78K0RKX3**	**CHAPTER 2 SETUP PROCEDURE**
	Change of **Figure 2-2. Acrylic Board Removal Method**	
	2.5.1 Mounting TC to target system • Change of (3) - Soldering conditions	
	Change of description in **2.5.4 Precautions for handling TC, YQ, SA, and CA**	
	Change of **Figure 2-5. Using Probe Holder**	
	Change of **Figure 2-6. GND Wire**	
	Change of **Figure 2-7. Where GND Wire Can Be Connected**	
	Change of **Figure 2-8. Connection Using Emulation Probe**	
	Change of **Figure 2-9. Connector Positions**	
	Deletion of **Figure 2-10. AC Plugs**	
	Change of **Figure A-1. Equivalent Circuit of Target Interface**	**APPENDIX A CHARACTERISTICS OF TARGET INTERFACE**
	Change of **Table A-1. Target Interface Combinations**	
	Deletion of **APPENDIX B NOTES ON TARGET SYSTEM DESIGN**	throughout
	Deletion of **APPENDIX C PACKAGE DRAWINGS**	
	Deletion of **APPENDIX D PIN HEADER COVER MOUNTING METHODS**	
	Addition of **APPENDIX B REVISION HISTORY**	

[MEMO]

For further information,
please contact:

NEC Electronics Corporation
1753, Shimonumabe, Nakahara-ku,
Kawasaki, Kanagawa 211-8668,
Japan
Tel: 044-435-5111
http://www.necel.com/

[America]

NEC Electronics America, Inc.
2880 Scott Blvd.
Santa Clara, CA 95050-2554, U.S.A.
Tel: 408-588-6000
800-366-9782
http://www.am.necel.com/

[Europe]

NEC Electronics (Europe) GmbH
Arcadiastrasse 10
40472 Düsseldorf, Germany
Tel: 0211-65030
http://www.eu.necel.com/

Hanover Office
Podbielskistrasse 166 B
30177 Hannover
Tel: 0 511 33 40 2-0

Munich Office
Werner-Eckert-Strasse 9
81829 München
Tel: 0 89 92 10 03-0

Stuttgart Office
Industriestrasse 3
70565 Stuttgart
Tel: 0 711 99 01 0-0

United Kingdom Branch
Cygnus House, Sunrise Parkway
Linford Wood, Milton Keynes
MK14 6NP, U.K.
Tel: 01908-691-133

Succursale Française
9, rue Paul Dautier, B.P. 52
78142 Velizy-Villacoublay Cédex
France
Tel: 01-3067-5800

Sucursal en España
Juan Esplandiu, 15
28007 Madrid, Spain
Tel: 091-504-2787

Tyskland Filial
Täby Centrum
Entrance S (7th floor)
18322 Täby, Sweden
Tel: 08 638 72 00

Filiale Italiana
Via Fabio Filzi, 25/A
20124 Milano, Italy
Tel: 02-667541

Branch The Netherlands
Steijgerweg 6
5616 HS Eindhoven
The Netherlands
Tel: 040 265 40 10

[Asia & Oceania]

NEC Electronics (China) Co., Ltd
7th Floor, Quantum Plaza, No. 27 ZhiChunLu Haidian
District, Beijing 100083, P.R.China
Tel: 010-8235-1155
http://www.cn.necel.com/

Shanghai Branch
Room 2509-2510, Bank of China Tower,
200 Yincheng Road Central,
Pudong New Area, Shanghai, P.R.China P.C:200120
Tel:021-5888-5400
http://www.cn.necel.com/

Shenzhen Branch
Unit 01, 39/F, Excellence Times Square Building,
No. 4068 Yi Tian Road, Futian District, Shenzhen,
P.R.China P.C:518048
Tel:0755-8282-9800
http://www.cn.necel.com/

NEC Electronics Hong Kong Ltd.
Unit 1601-1613, 16/F., Tower 2, Grand Century Place,
193 Prince Edward Road West, Mongkok, Kowloon, Hong Kong
Tel: 2886-9318
http://www.hk.necel.com/

NEC Electronics Taiwan Ltd.
7F, No. 363 Fu Shing North Road
Taipei, Taiwan, R. O. C.
Tel: 02-8175-9600
http://www.tw.necel.com/

NEC Electronics Singapore Pte. Ltd.
238A Thomson Road,
#12-08 Novena Square,
Singapore 307684
Tel: 6253-8311
http://www.sg.necel.com/

NEC Electronics Korea Ltd.
11F., Samik Lavied'or Bldg., 720-2,
Yeoksam-Dong, Kangnam-Ku,
Seoul, 135-080, Korea
Tel: 02-558-3737
http://www.kr.necel.com/

G0706