User's Manual

32

RX130 Group

RX Capacitive Touch Evaluation System CPU Board

User's Manual

Renesas 32-bit Microcontroller

RX Family/RX100 Series

Renesas Solution Starter Kit

RX Capacitance Touch Evaluation System

Renesas Electronics
www.renesas.com

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1. Precaution against Electrostatic Discharge (ESD)
   A strong electrical field, when exposed to a CMOS device, can cause destruction of the gate oxide and ultimately degrade the device operation. Steps must be taken to stop the generation of static electricity as much as possible, and quickly dissipate it when it occurs. Environmental control must be adequate. When it is dry, a humidifier should be used. This is recommended to avoid using insulators that can easily build up static electricity. Semiconductor devices must be stored and transported in an anti-static container, static shielding bag or conductive material. All test and measurement tools including work benches and floors must be grounded. The operator must also be grounded using a wrist strap. Semiconductor devices must not be touched with bare hands. Similar precautions must be taken for printed circuit boards with mounted semiconductor devices.
2. Processing at power-on
   The state of the product is undefined at the time when power is supplied. The states of internal circuits in the LSI are indeterminate and the states of register settings and pins are undefined at the time when power is supplied. In a finished product where the reset signal is applied to the external reset pin, the states of pins are not guaranteed from the time when power is supplied until the reset process is completed. In a similar way, the states of pins in a product that is reset by an on-chip power-on reset function are not guaranteed from the time when power is supplied until the power reaches the level at which resetting is specified.
3. Input of signal during power-off state
   Do not input signals or an I/O pull-up power supply while the device is powered off. The current injection that results from input of such a signal or I/O pull-up power supply may cause malfunction and the abnormal current that passes in the device at this time may cause degradation of internal elements. Follow the guideline for input signal during power-off state as described in your product documentation.
4. Handling of unused pins
   Handle unused pins in accordance with the directions given under handling of unused pins in the manual. The input pins of CMOS products are generally in the high-impedance state. In operation with an unused pin in the open-circuit state, extra electromagnetic noise is induced in the vicinity of the LSI, an associated shoot-through current flows internally, and malfunctions occur due to the false recognition of the pin state as an input signal become possible.
5. Clock signals
   After applying a reset, only release the reset line after the operating clock signal becomes stable. When switching the clock signal during program execution, wait until the target clock signal is stabilized. When the clock signal is generated with an external resonator or from an external oscillator during a reset, ensure that the reset line is only released after full stabilization of the clock signal. Additionally, when switching to a clock signal produced with an external resonator or by an external oscillator while program execution is in progress, wait until the target clock signal is stable.
6. Voltage application waveform at input pin
   Waveform distortion due to input noise or a reflected wave may cause malfunction. If the input of the CMOS device stays in the area between V_{IL} (Max.) and V_{IH} (Min.) due to noise, for example, the device may malfunction. Take care to prevent chattering noise from entering the device when the input level is fixed, and also in the transition period when the input level passes through the area between V_{IL} (Max.) and V_{IH} (Min.).
7. Prohibition of access to reserved addresses
   Access to reserved addresses is prohibited. The reserved addresses are provided for possible future expansion of functions. Do not access these addresses as the correct operation of the LSI is not guaranteed.
8. Differences between products
   Before changing from one product to another, for example to a product with a different part number, confirm that the change will not lead to problems. The characteristics of a microprocessing unit or microcontroller unit products in the same group but having a different part number might differ in terms of internal memory capacity, layout pattern, and other factors, which can affect the ranges of electrical characteristics, such as characteristic values, operating margins, immunity to noise, and amount of radiated noise. When changing to a product with a different part number, implement a system-evaluation test for the given product.

How to Use This Manual

1. Purpose and Target Readers

This manual is designed to provide the user with a general understanding of the Capacitive Touch CPU Board and its electrical characteristics. It is intended for users designing sample code on the RSSK platform, using the many different incorporated peripheral devices.
The manual includes an overview of the Capacitive Touch CPU Board functions, but does not serve as a guide for embedded programming or hardware design. A basic knowledge of electric circuits, logical circuits, and MCUs is necessary in order to use this manual.

Particular attention should be paid to the precautionary notes when using the manual. These notes occur within the body of the text, at the end of each section, and in the Usage Notes section.

The revision history summarizes the locations of revisions and additions. It does not list all revisions. Refer to the text of the manual for details.

The following documents apply to the RX130 Group, RX Capacitive Touch CPU Board included in the Renesas Capacitive Touch Evaluation System. Make sure to refer to the latest versions of these documents. The newest versions of the documents listed may be obtained from the Renesas Electronics Web site.

Document Type	Description	Document Title	Document No.
User's manual	Description of hardware (pin assignments, memory map, peripheral functions, electrical characteristics, timing) and operations. *Refer to corresponding application notes for descriptions on how to use peripheral functions.	RX130 Group RX Capacitive Touch Evaluation System CPU Board User's Manual	This User's Manual
Quick Start Guide	Quick and easy setup guide	RX Capacitive Touch Evaluation System Quick Start Guide	R12UZ0007EJ

The following documents are also available for the RX130 Group. The latest versions of all documents are available for download from the Renesas Electronics website.

Document Type	**Description**	**Document Title**	**Document No.**
Application Note	Peripheral function usage instructions, sample applications Reference programs Programming instructions for Assembler language and C language	Available on the Renesas Electronics website	
Renesas Technical Update	Updates concerning product specifications, documentation, etc.		

2. List of Abbreviations and Acronyms

Abbreviation	Full Form
ACIA	Asynchronous Communications Interface Adapter
bps	bits per second
CRC	Cyclic Redundancy Check
DMA	Direct Memory Access
DMAC	Direct Memory Access Controller
GSM	Global System for Mobile Communications
Hi-Z	High Impedance
IEBus	Inter Equipment Bus
I/O	Input/Output
IrDA	Infrared Data Association
LSB	Least Significant Bit
MSB	Most Significant Bit
NC	Non-Connect
PLL	Phase Locked Loop
PWM	Pulse Width Modulation
SFR	Special Function Register
SIM	Subscriber Identity Module
UART	Universal Asynchronous Receiver/Transmitter
VCO	Voltage Controlled Oscillator

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Precautions

This Evaluation Kit is only intended for use in a laboratory environment under ambient temperature and humidity conditions. A safe separation distance should be used between this and any sensitive equipment. Its use outside the laboratory, classroom, study area, or similar such area invalidates conformity with the protection requirements of the Electromagnetic Compatibility Directive and could lead to prosecution.

The product generates, uses, and can radiate radio frequency energy and may cause harmful interference to radio communications. There is no guarantee that interference will not occur in a particular installation. If this equipment causes harmful interference to radio or television reception, which can be determined by turning the equipment off or on, you are encouraged to try to correct the interference by one or more of the following measures:

• Ensure attached cables do not lie across the equipment.

• Reorient the receiving antenna.

• Increase the distance between the equipment and the receiver.

• Connect the equipment into an outlet on a circuit different from that which the receiver is connected.

• Power down the equipment when not in use.

• Consult the dealer or an experienced radio/TV technician for help.

Note: It is recommended that wherever possible shielded interface cables are used.

The product is potentially susceptible to certain EMC phenomena. To mitigate against them it is recommended that the following measures be undertaken:

• The user is advised that mobile phones should not be used within 10 m of the product when in use.

• The user is advised to take ESD precautions when handling the equipment.

The Evaluation Kit does not represent an ideal reference design for an end product and does not fulfill the regulatory standards for an end product.

Safety Items

Definitions of Symbols

A variety of symbols are used in this document and on the product itself to prevent in advance danger to you the user or any third parties and to prevent in advance damage to any physical property.
This section, Safety Items, presents these symbols and their meanings. It also presents safety notes to assure that this produce is used safely and correctly.
This product should only be used after fully understanding the material presented in this section.

Warning — Warning items indicate things that, if not avoided, could lead to death or serious injury.

Caution — Caution items indicate both latent dangers that can lead to minor or moderately severe injury and latent dangers that can lead to property damage if not avoided.

In addition to the above two markings, the following are displayed at the same time if appropriate.

[Important] Indicates a point that can lead to equipment failure or malfunction if incorrectly set when setting up this product.

A triangular mark △ indicates a warning or caution.

Example:

The ⃠ mark indicates something that is forbidden.

Example: :

Warning

⚠ Warning
Handling related warnings:  Do not disassemble or modify this product. Renesas does not guarantee this product if it has been disassembled or modified. The power supply for this product can be selected to be either the USB bus or a DC jack. A jumper is used to select the power supply. If, during either use or storage of this product, any abnormality in the product itself (including abnormal odors, heating, color changes, or shape changes to the product itself) are observed, disconnect the USB cable and power supply cable immediately.
Installation:  Do not install this equipment in a location that has a high humidity or where water or other fluids could get on it. This equipment may be damaged if water or other fluids could get on it.
Ambient temperature:  The upper limit for the ambient temperature under which this product may be used is 35°C. This maximum rated ambient temperature must not be exceeded.

Caution

⚠Caution
Handling related cautions: Use the antistatic band. Failure to do so could cause malfunction or unstable motion or be damaged Internal components. This product must be handled carefully. Do not drop, knock over, or apply any strong mechanical shocks to this product. When connecting or disconnecting cables from this product, hold the parts of the cable intended to be grasped (such as the plugs) and avoid putting stress on the cable. Do not pull on this product when it is connected to a communications cable or user system connection cable. Stress on the cable can result in internal disconnections in the cable. When connecting a cable to a connector, be careful not to insert the plug in the reverse orientation. Reverse insertion can result in damage to this product itself or to connected equipment. The power supply for this product can be selected from two options (the DC jack or the USB cable). The jumper JP1 (on the top side of the circuit board) is used to select the power supply. Always check the jumper position before connecting a power source. An incorrect jumper position can result in damage to this product or the PC connected over the USB cable. Do not handle this product with wet hands. This can lead to failure of the product.
Transport methods: **When transporting this product, use the product's packing box and cushioning materials and ship** it with precision equipment handling. If the products packing is insufficient, it may be damaged during shipping. If it must be transported by some other method, pack it carefully as precision equipment. When packing this product, always use the antistatic pouch included with this product. If some other pouch is used, damage to the product may be caused by electrostatic discharge.
Abnormal operation: If operation of this product becomes abnormal due to interference from, for example, external noise, apply the following procedure. 1. Turn off the power. 2. Wait 10 seconds and then turn the power back on.
Disposal: When disposing of this product, handle it as industrial waste according to all applicable laws. European Union regulatory notices: The WEEE （Waste Electrical and Electronic Equipment） regulations put responsibilities on producers for the collection and recycling or disposal of electrical and electronic waste. Return of WEEE under these regulations is applicable in the European Union only. This equipment （including all accessories） is not intended for household use. After use the equipment cannot be disposed of as household waste, and the WEEE must be treated, recycled and disposed of in an environmentally sound manner. Renesas Electronics Europe GmbH can take back end of life equipment, register for this service at "http://www.renesas.eu/weee".

Electromagnetic Environment

⚠Electromagnetic Environment	
⚠	・This product generates electromagnetic emissions in an industrial environment. Use in a residential environment may affect other equipment. ・This product requires special EMC precautions and should be used in accordance with the EMC information provided below.

EMI: Electro Magnetic Interference			
Standard		Level	Guidance for EMC protection
Test Item	EN 55011 :2009+A1:2010	Group1 Class A	This product has no intentional external emissions, but internal RF emissions may affect nearby electromagnetically sensitive electronic equipment.
Radiated Emissions			

EMS: Electro Magnetic Susceptibility			
Standard		Level	Guidance for EMC protection
Electrostatic Discharge	EN 61000-4-2:2009	B[*1]	This product is intended for use in electromagnetic environments in industrial settings. The user of the product should pay particular attention to the following electromagnetic immunity. ・Power supply quality ・Protection against static electricity ・Protection against external high-power radio waves ・Protection against external magnetic fields
Radio Frequency Electromagnetic Field	EN 61000-4-3: 2006+A1:2008+A2:2010	A[*2]	

*1 Test Condition of Electrostatic Discharge

Discharge Method		Test Voltage	Result
Indirect Discharge	VCP	±4.0kV	Pass
	HCP	±4.0kV	Pass
Direct Discharge	Contact Discharge	±4.0kV	Pass
	Air Discharge	±2.0kV	Pass
		±4.0kV	Pass
		±8.0kV	Pass

*2 Test Condition of Radio Frequency Electromagnetic Field

Test Level	Dwell Time	Modulation	Frequency Step	Antenna Polarization	Result
3V/m (80MHz - 1.0GHz)	1.0sec	1kHz AM 80%	1.0%	Horizontal / Vertical	Pass
3V/m (1.4GHz – 6.0GHz)					Pass

Table of Contents

1. Overview

1.1 Purpose

This CPU board is an evaluation tool for Renesas microcontrollers. This manual explains the technical components of the hardware in detail.

1.2 Features

This CPU board offers the following features:

- Renesas microcontroller programming
- User code debugging
- User circuits for switches, LEDs, etc.
- Sample application
- Capacitive Touch Sensing Control Unit (CTSU)
  - 36 channels available
- RX Capacitive Touch Evaluation System Application Board (option)

1.3 Board Specifications

The CPU board specifications are shown in Table 1.1.

Table 1.1 CPU Board Specifications

Item	Specification
Microcontroller	Part No: R5F5130ADFN
	Package: 80-pin LFQFP
	On-chip memory: ROM 128KB+8KB、RAM16KB
Input Clock	Main clock: 16MHz (option)
	Subclock: 32.768KHz (option
Power Supply	DC power jack: 5.0 to 3.3V input
	USB bus-powered (VBUS): 5V
Debug Interface	E1 14-pin box header
DIP Switch	Mod configuration: 2-pole x 1
Push Switch	Reset switch x 1
	User switch x 3
LED	Power indicator: red x 1
	User: green x 1, orange x 1, red x 1
USB to Serial Conversion Interface	Connector: USB-MiniB
	Driver: FT232R USB serial IC (manufactured by FTDI)
Application Board Interface (GPIO)	2.54-mm pitch, 16-pin x 1 (CN1)
Application Board Interface(CTSU)	2.54-mm pitch,40-pin x 1 (CN2)
Low-power Consumption Current	500mA or less
Operating Temperature Range	When operating: 10 to 35˚C, in storage: -10 to 50˚C no condensation
Dimensions(L x W x H)	89mm x 95mm x 18mm

1.4 Regulatory Compliance Notices

1.4.1 European Union regulatory notices

This product complies with the following EU Directives. (These directives are only valid in the European Union.)

CE Certifications:

- Electromagnetic Compatibility (EMC) Directive 2014/30/EU
  EN IEC61326-1: 2021 Group1 Class A

WARNING:	This is a Class A product. This equipment can cause radio frequency noise when used in the residential area. In such cases, the user/operator of the equipment may be required to take appropriate countermeasures under his responsibility.

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    Address: Toyosu Foresia, 3-2-24, Toyosu, Koto-ku, Tokyo 135-0061, Japan
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    Address: Arcadiastrasse 10, 40472 Dusseldorf, Germany
  - Trademark and Type name
    Trademark: Renesas
    Product name: RX130 Capacitive Touch Evaluation System
    Type name: RTK0EG0003S02001BJ

Environmental Compliance and Certifications:

Waste Electrical and Electronic Equipment (WEEE) Directive 2012/19/EU

2. Power Supply

2.1 Requirements

Although the CPU board does not come with an E1 debugger, the debugger can be used to power the board by connecting it to CN5. When not using an E1 debugger, the USB cable included with the CPU board can be connected to CN6 to supply power. Finally, by changing the board settings, it can be powered using a center positive 2.1-mm barrel power jack.

Details of the external power supply connection and settings are shown in Table 2.1. The default configuration and initial settings of the CPU board are shown in **bold, blue text**.

Table 2.1 Power Supply Requirements

JP1	Supply Source	Supply Source	Supply Voltage
Pin 1-2 shorted	**USB Cable (CN6)**	**USB VBUS**	**5.0 VDC**
Pin 2-3 shorted	Barrel Jack (CN3)	External Supply	5.0 – 3.3VDC
	Battery (V1) *1 *2	Battery	3.0 VDC

Notes *1: Option
*2: When barrel power jack is not connected

2.2 Power-up Behavior

At the time of purchase, the microcontroller on the CPU board is pre-programmed with sample software. This software automatically recognizes what type of Renesas Capacitive Touch Evaluation System application board is connected to the CPU board and runs the corresponding demo program. Refer to the RX Capacitive Touch Evaluation System Quick Start Guide for more information.

3. Board Layout

3.1 Component Layout

Figure 3.1 shows the component layout of the RX130CPU board.

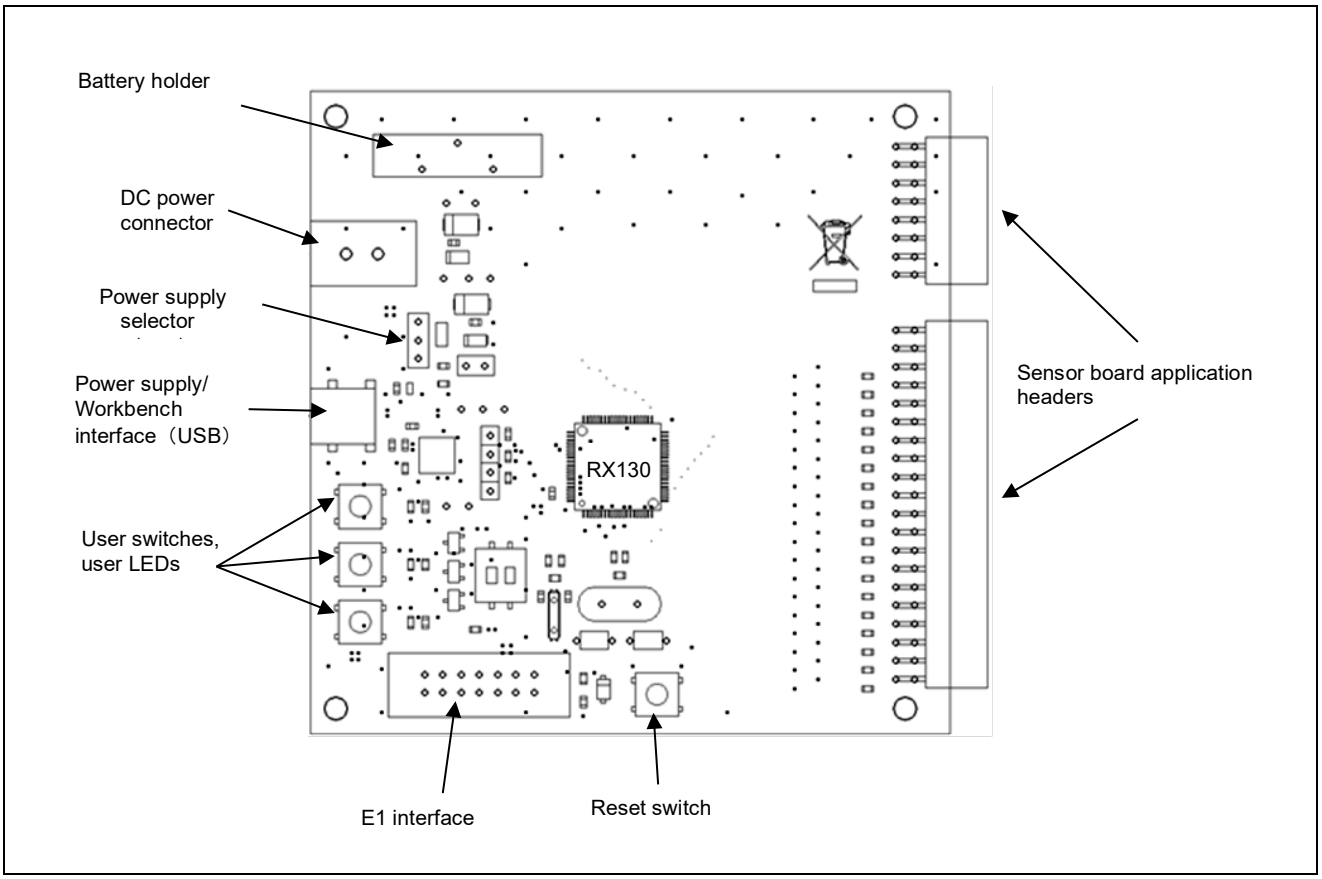
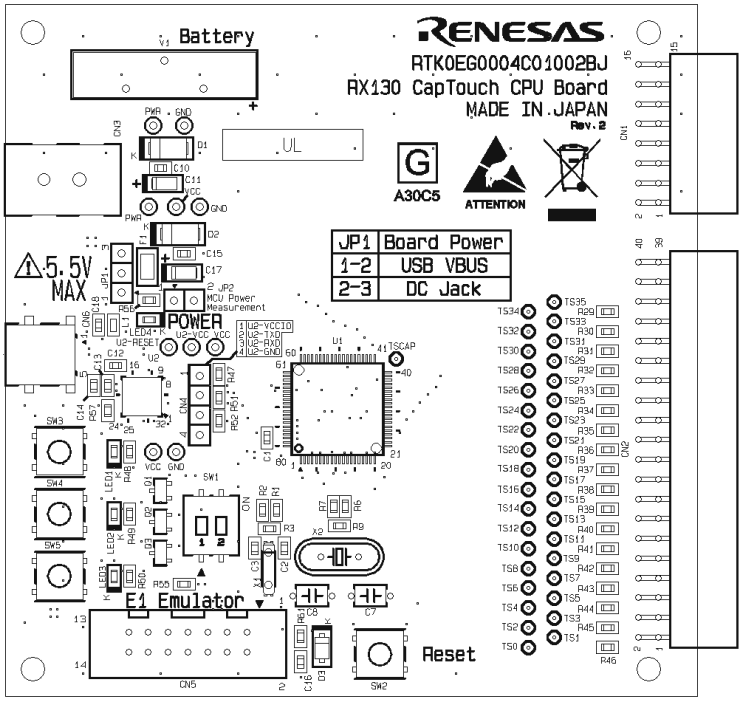


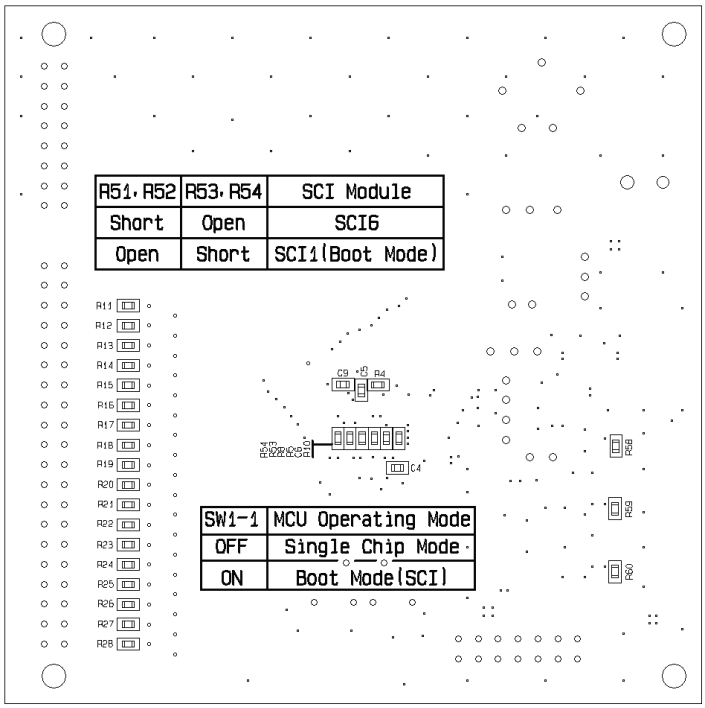
Figure 3.1 Component Layout

3.2 Component Placement

Figure 3.2 shows placement of individual components on the RX130 CPU board. Component numbers and values are also shown on the board schematics.



Top-side Components Placement



Bottom-side Components Placement

Figure 3.2 RX130CPU Board Component Placement Schematics

4. Connectivity

4.1 System Block Diagrams

Figure 4.1 provides a system block diagram for the CPU board.

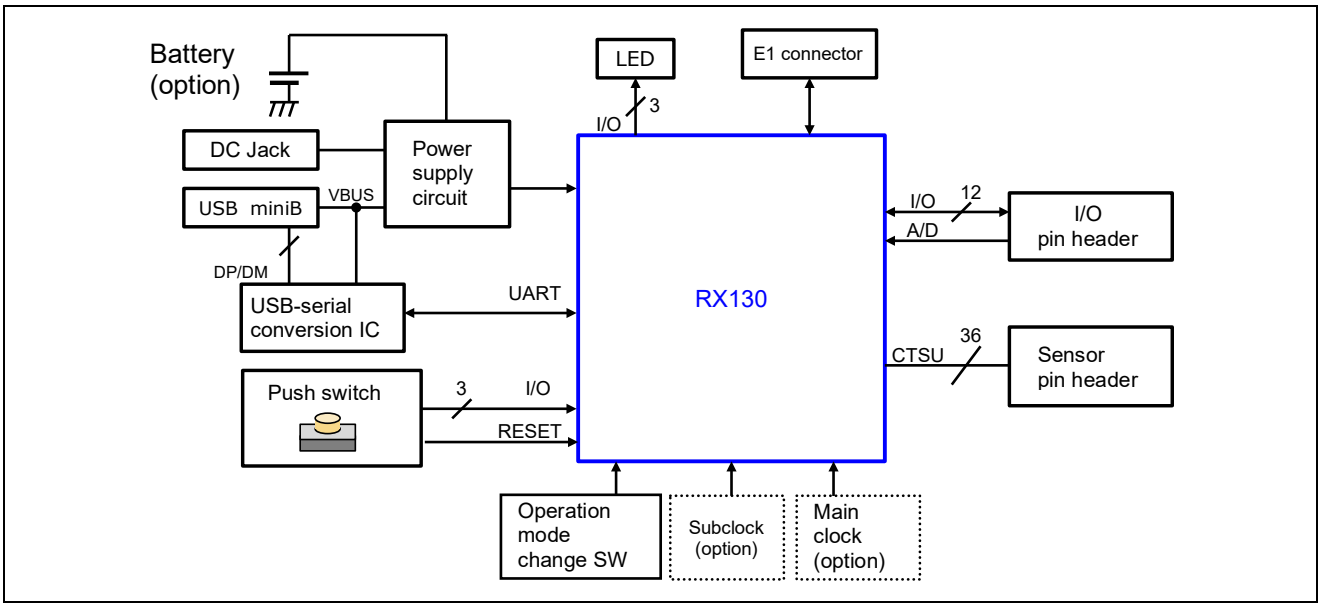


Figure 4.1 System Block Diagram

4.2 Debugger Connections

Figure 4.2 shows the connections between the CPU board, E1 emulator (option) and host machine.

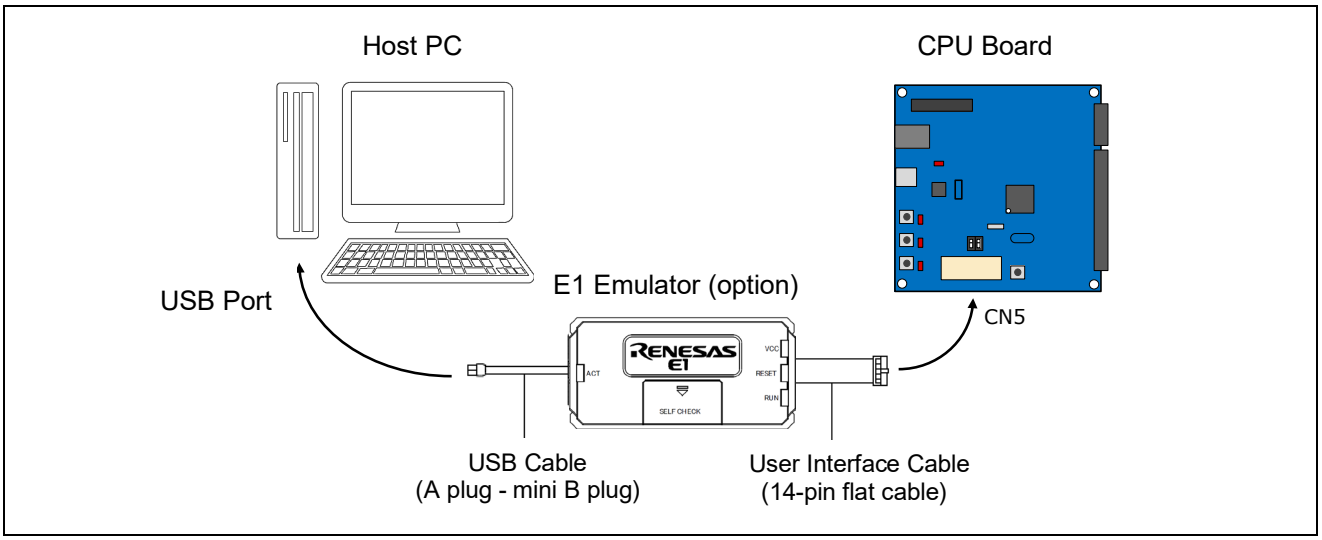


Figure 4.2 Debugger Connection Diagram

5. User Circuitry

5.1 Reset Circuit

The CPU board uses the MCU's built-in power-on reset circuit. In addition, a reset signal can be generated from the board's RES switch. Refer to the RX130 Group hardware manual for details regarding the microcontroller reset requirements and the CPU board circuit diagrams for information regarding the reset circuitry in use on the CPU board.

5.2 Clock Circuit

A clock circuit is fitted to the CPU board as the clock source for the MCU. Refer to the RX130 Group user's manual for details regarding the MCU clock specifications and the CPU board circuit diagram for information regarding the CPU board clock circuit. Details of the clocks fitted to the board are listed in Table 5.1.

Table 5.1 CPU Board Clocks

Clock	Function	Default Placement	Frequency	Device Package
X1	Main clock	Not fitted	-	HC49/US
X2	Subclock	Not fitted	-	Encapsulated, SMT

5.3 Switches

The CPU board is fitted with four push switches. Table 5.2 shows the function and connection of each switch.

Table 5.2 Switch Functions and Connections

Switch	Function	Signal (Port)	MCU
SW2（Reset）	When pressed, the microcontroller is reset.	RES#	9
SW3	Connects to an NMI input for user controls	NMI (P35)	14
SW4	Connects to an IRQ input for user controls	IRQ2 (P12)	28
SW5	Connects to an IRQ input for user controls	IRQ3 (P13)	27

5.4 LEDs

The CPU board is fitted with four LEDS. Table5.3 shows the function, color, and connection of each LED.

Table 5.3 LED Functions, Colors, and Connections

LED	Color	Function	Port	MCU
LED4 (Power)	Red	Indicates the status of the Board_VCC power rail	-	-
LED1	Green	User operated LED	P03	2
LED2	Orange	User operated LED	P04	3
LED3	Red	User operated LED	P06	1

5.5 USB Serial Conversion

For USB-serial conversion, USB serial IC FT232 (manufactured by FTDI) is mounted on the CPU board and connected to the RX130 Serial Communications Interface (SCI) module. Functions differ according to which SCI pin is connected to the board. Table 5.4 provides details of the USB serial IC and microcontroller connection.

Table 5.4 USB Serial Port Connections

Signal Name	Function	MCU	
		Port	Signal Name
TXD6	SCI6 transmit signal	PD0	TXD6
RXD6	SCI6 receive signal	PD1	RXD6
TXD1 *1	SCI1 transmit signal	P26	TXD1 *1
RXD1 *1	SCI1 receive signal	P30	RXD1 *1

Note *1 :Not connected as the default. To modify, refer to section 6.

6. Configuration

6.1 Modifying the CPU Board

This section lists the option links that are used to modify the way the CPU board operates in order to access different configurations. Configurations can be modified using option link resistors, jumpers or DIP switches. A link resistor is a 0Ω surface mount resistor, which is used to connect or isolate parts of a circuit. Option links are listed in the following subsections, detailing their function when fitted or removed. Connection details for ICs other than the MCU as well as headers is also provided. **Bold, blue text** indicates the default configuration that the CPU board is supplied with. Refer to the component placement diagram (Section 3) to locate the option links, jumpers and DIP switches.

6.2 MCU Settings

Table 6.1 details the option links associated with configuring the MCU operating modes.

Table 6.1 MCU Operating Mode Option Links

Reference	Pin1	Pin2	Explanation	Related Ref.
SW1	**OFF**	-	**Single Chip Mode**	-
	ON		Boot Mode(SCI)	R53,R54, R44, R55

6.3 Power Supply Configuration

Table 6.2 lists the function of the option links associated with the power supply configuration.

Table 6.2 Power Supply Option Links

Reference	Jumper Position	Explanation	Related Ref.
JP1	**Shorted Pin 1-2**	**Connects USB_VBUS to VCC.**	U2 (VCCIO)
	Shorted Pin 2-3	Connects PWR (CN3) to VCC.	U2 (VCCIO)
		Connects V1 to VCC (when CN3 is not connected).	U2 (VCCIO)
	All open	Disconnects USB_VBUS and PWR from VCC rail.	-
JP2	**Shorted Pin 1-2**	**Connects VCC to MCU_VCC.**	U1(VCC)
	All open	Enables current probe for MCU current consumption (connect current meter between JP2 and MCU).	-

6.4 Clock Configuration

Table 6.3 details the option link functions associated with the clock configuration.

Table 6.3 Clock Option Links

Reference	Explanation	Fit	Not Fitted	Related Ref.
P36/EXTAL, P37/XTAL	Connects crystal oscillator X1 to RX130.	R6,R7	-	U1 (EXTAL, XTAL)
	Disconnects X1 from RX130.	**-**	**R6,R7**	
XCOUT, XCIN	Connects 32.768kHz crystal(X2) to RX130.	R1, R2	-	U1 (XCOUT, XCIN)
	Disconnects X2 from RX130.	-	**R1, R2**	

*Items shown in **bold** are the Fit / Not Fitted default configuration in which the CPU board is supplied.

6.5 Serial Configuration

Table 6.4 lists the option links associated to the serial configuration.

Table 6.4 Serial Option Links

Signal Name	MCU		Destination Selection		
	Port	Pin	Function	Fit	Not Fitted
PD1/RXD6	PD1	65	**RXD6**	**R51**	**R53**
PD0/TXD6	PD0	66	**TXD6**	**R52**	**R54**
TS2/RXD1	P30	118	RXD1	R53	R51, R44
			TS2	**R44 (560Ohm)**	**R53**
TS4/TXD1	P26	20	TXD1	R54	R52, R45
			TS4	**R45 (560Ohm)**	**R54**

*Items shown in **bold** are the Fit / Not Fitted default configuration in which the CPU board is supplied.

7. Headers

7.1 Application Headers

Table 7.1 Application Headers (CN1) Connections

Application Header CN1		MCU		Application Header CN1		MCU	
Pin	Header Name	Port	Pin	Pin	Header Name	Port	Pin
1	PE1	PE1	62	2	PE0	PE0	63
3	PD2	PD2	64	4	P47	P47	67
5	P46	P46	68	6	P45	P45	69
7	P44	P44	70	8	P43	P43	71
9	P42	P42	72	10	P41	P41	73
11	P40	P40	75	12	PJ6	PJ6	76
13	NC	-	-	14	PE5/AN021	PE5	58
15	VCC	-	-	16	GND	-	-

- : Non Connection

Table 7.2 Application Headers (CN2) Connections

Application Header CN2		MCU		Application Header CN2		MCU	
Pin	Header Name	Port	Pin	Pin	Header Name	Port	Pin
1	TS0	P32	16	2	TS1	P31	17
3	TS2	P30	18	4	TS3	P27	19
5	TS4	P26	20	6	TS5	P15	25
7	TS6	P14	26	8	TS7	PH3	29
9	TS8	PH2	30	10	TS9	PH1	31
11	TS10	PH0	32	12	TS11	P55	33
13	TS12	P54	34	14	TS13	PC7	35
15	TS14	PC6	36	16	TS15	PC5	37
17	TS16	PC3	39	18	TS17	PC2	40
19	TS18	PB7	41	20	TS19	PB6	42
21	TS20	PB5	43	22	TS21	PB4	44
23	TS22	PB3	45	24	TS23	PB2	46
25	TS24	PB1	47	26	TS25	PB0	49
27	TS26	PA6	51	28	TS27	PA5	52
29	TS28	PA4	53	30	TS29	PA3	54
31	TS30	PA2	55	32	TS31	PA1	56
33	TS32	PA0	57	34	TS33	PE4	59
35	TS34	PE3	60	36	TS35	PE2	61
37	NC	-	-	38	NC	-	-
39	NC	-	-	40	NC	-	-

- : Non Connection

8. Circuit Diagram

The circuit diagram is shown on the Appendix 1.

9. PCB Layout Diagram

The PCB layout diagram is shown on the Appendix 2.

10. Parts List

The Parts list is shown on the Appendix 3.

11. Code Development

11.1 Overview

For all code debugging using Renesas software tools, the CPU board must be connected to a PC via an E1 emulator debugger. An E1 debugger is not supplied with this product and must be procured separately.
For further information regarding the debugging capabilities of the E1 debugger, refer to RX Family E1/E20 Emulator User's Manual (R20UT0399EJ).

11.2 Software Project

Renesas offers a software project to be used with the Capacitive Touch Evaluation System application board. The project software can be downloaded from the product website.

11.3 Compiler Restrictions

The compiler supplied with this product is fully functional for a period of 60 days from installation and first use. After the first 60 days of use have expired, the complier will default to a maximum of 128k code and data. To use the compiler with programs greater than this size you need to purchase the license for the full version from your distributor.
Note: The protection software for the compiler will detect changes to the system clock. Changes to the system clock back in time may cause the trial period to expire prematurely.

11.4 Mode Support

The MCU supports single chip and boot (SCI) modes, which are configured on the CPU board. Details of the modifications required can be found in section 6.2. All other MCU operating modes are configured within the MCU's registers, which are listed in the RX130 Group Hardware Manual.
To avoid damage to the MCU, modify the mode configuration after cutting power supply to the CPU board or when the MCU reset signal is low.

11.5 Debugging Support

The E1 emulator supports software break points, hardware event points and basic trace functionality. It is limited to a maximum of 8 on-chip event points, 256 software breaks and 256-trace functionality (branches/cycles). For further details, refer to the RX Family E1/E20 Emulator User's Manual (R20UT0398EJ).

11.6 Address Space

For the MCU address space details corresponding to each MCU operating mode, refer to the "Address Space" section of the RX130 Group Hardware Manual

12. Additional Information

Technical Support

For more information about how to use the Integrated Development Environment (IDE), refer to the IDE help menu.

For information about the RX130 Group microcontrollers, refer to the RX130 Group User's Hardware Manual.

For general information on Renesas microcontrollers, visit : https://www.renesas.com/

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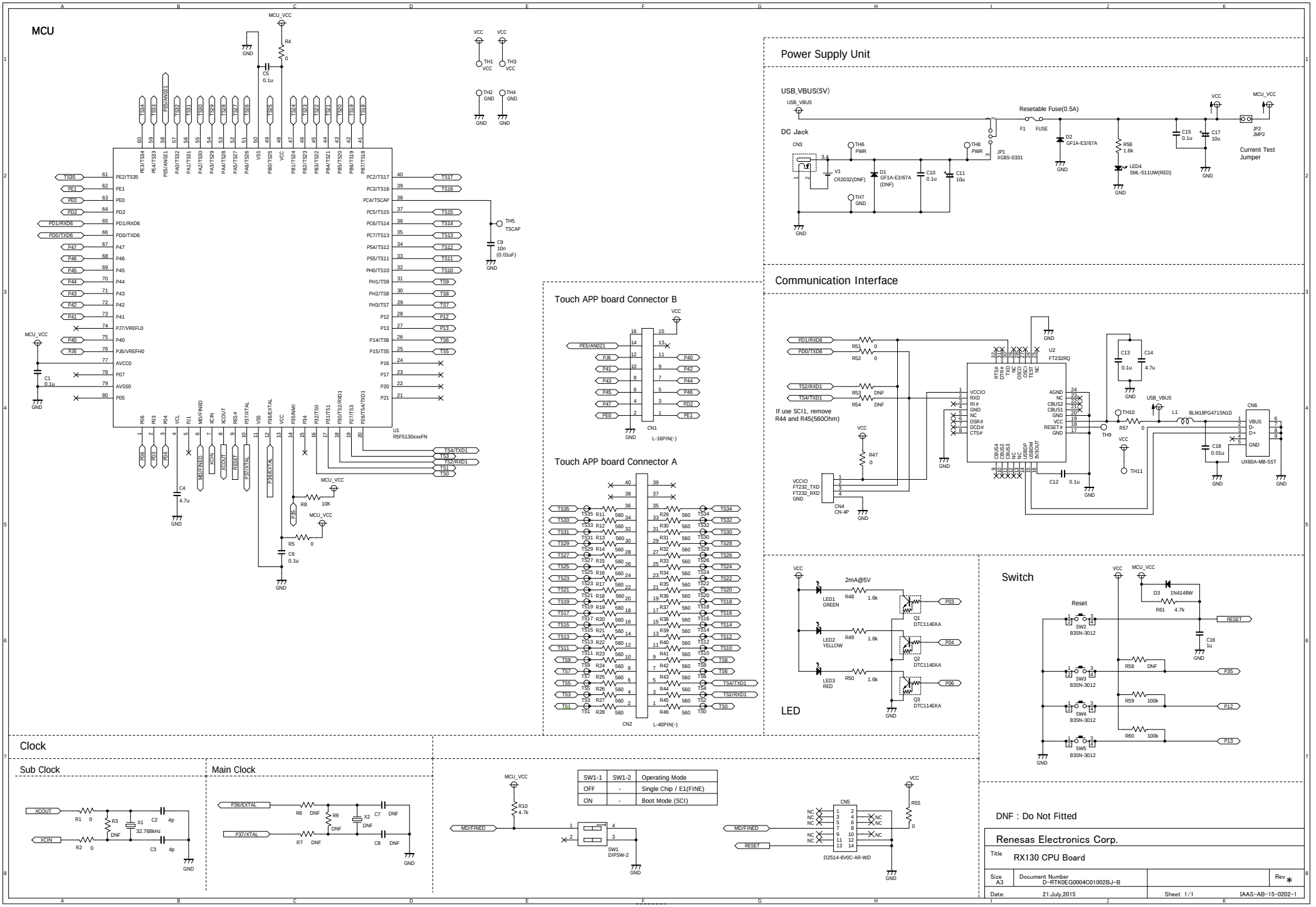
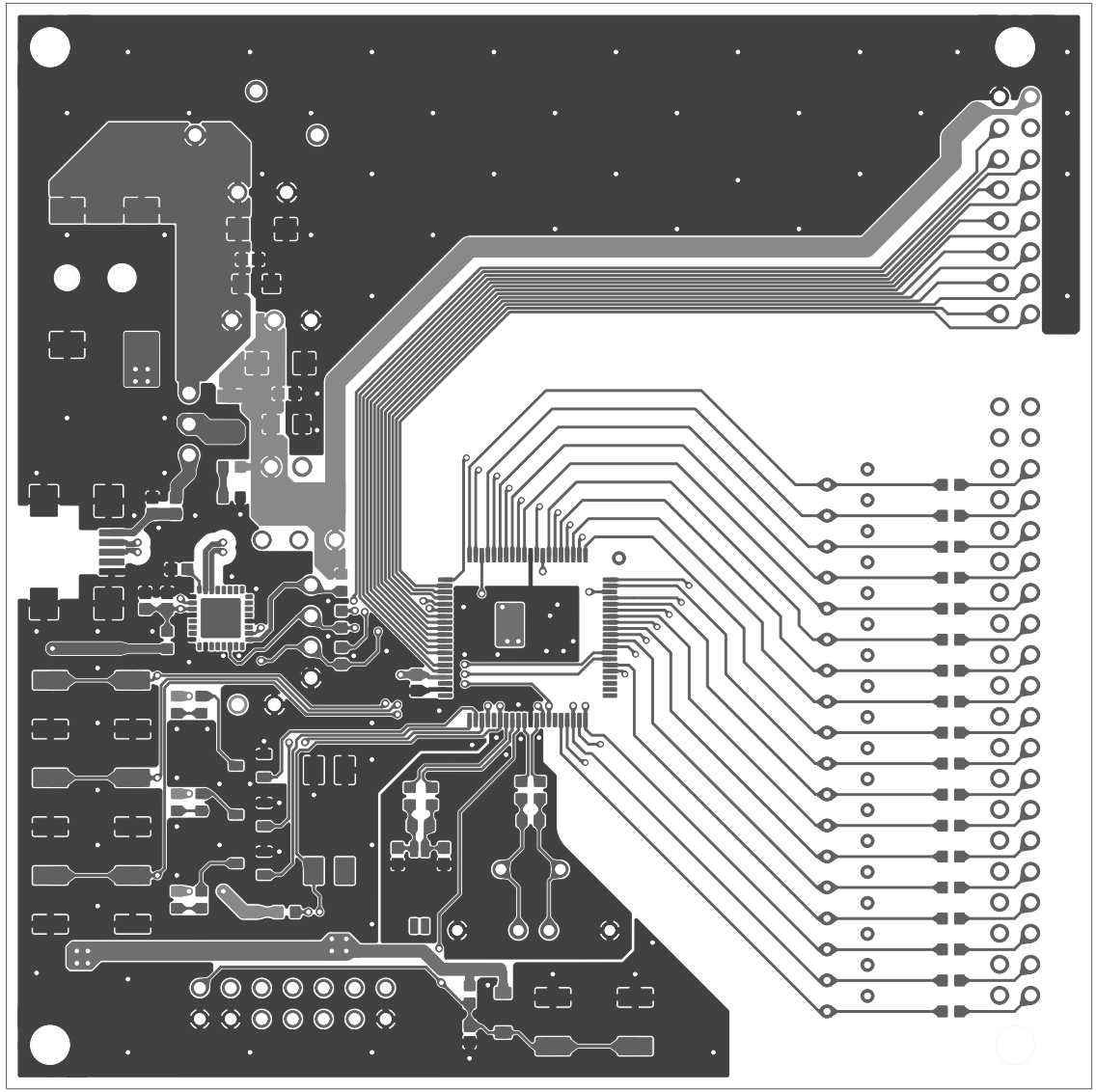
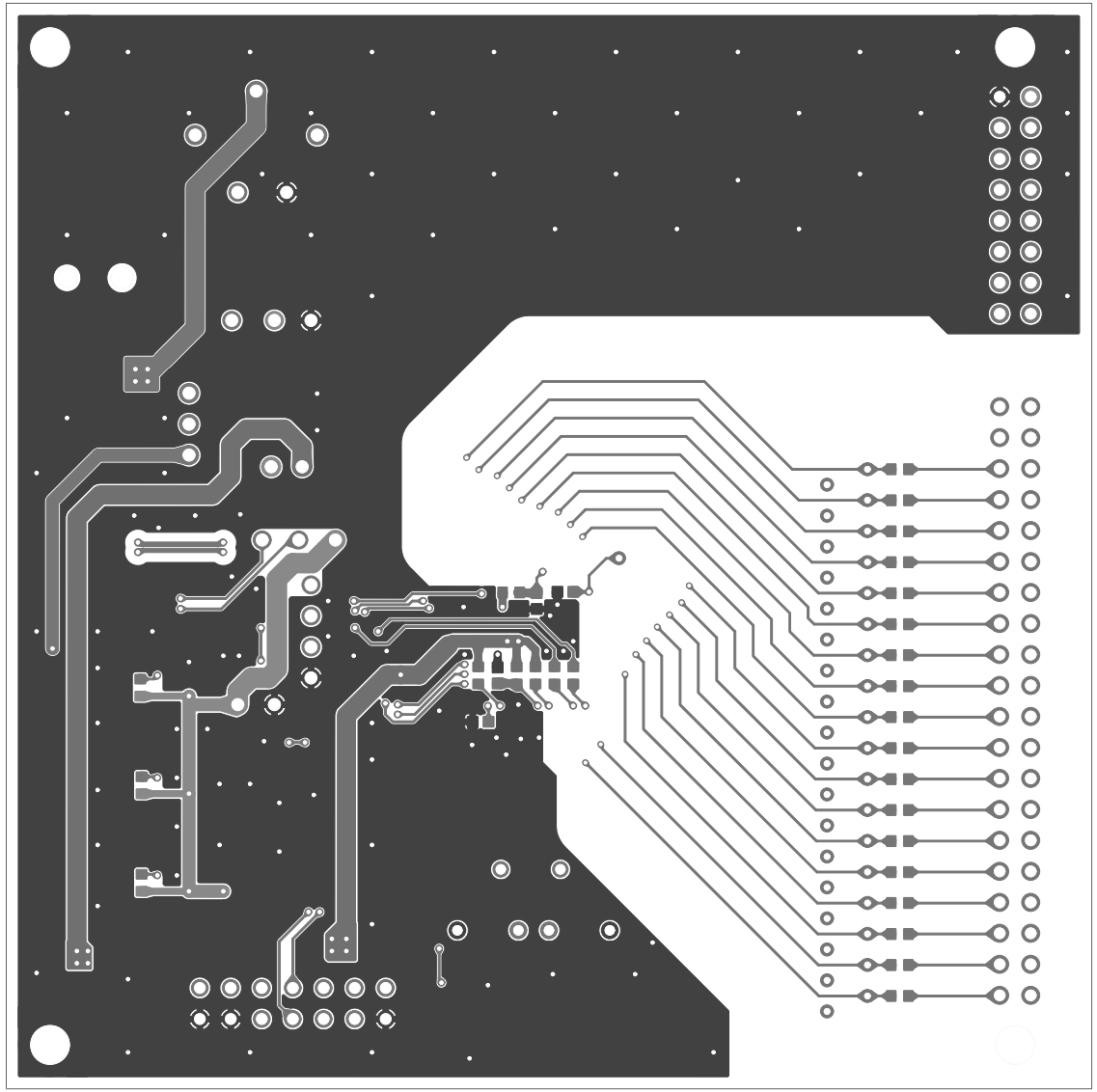
Appendix 1.


MCU
Power Supply Unit
USB_VBUS(5V)
DC Jack
Resetable Fuse(0.5A)
Current Test Jumper
Communication Interface
If use SCI1, remove R44 and R45(560Ohm)
Touch APP board Connector B
Touch APP board Connector A
L-16PIN(-)
L-40PIN(-)
LED
2mA@5V
Switch
Reset
Clock
Sub Clock
Main Clock
32.768kHz
SW1-1 SW1-2 Operating Mode
OFF - Single Chip / E1(FINE)
ON - Boot Mode (SCI)
DNF : Do Not Fitted
Renesas Electronics Corp.
RX130 CPU Board
21.July.2015
IAAS-AB-15-0202-1

Appendix 2.



PCB Top-side Layout



PCB Bottom-side Layout

Appendix 3.

Renesas Electronics Corp.

PartNo	RTK0EG0004C01002BJ	Title	RX Capacitive Touch Evaluation System RX130 CPU Board BOM

No	Component Name		Component Specification			Qty/Set	Remarks
	Type	Reference	Product Number (Specfication)	Manufacture	Mount/Unmount		
1	Microcomputer	U1	R5F51305ADFN	Renesas	Mount	1	
2	USB-Serial Converter IC	U2	FT232RQ	FTDI	Mount	1	
3	Chip Capacitor	C9, C18	GRM188B11H103KA01D	Murata	Mount	2	0.01u(10n)
4	Chip Capacitor	C1, C5, C6, C10, C12, C13, C15	GRM188B11E104KA01D	Murata	Mount	7	0.1u
5	Chip Capacitor	C11, C17	F931C106MAA	AVX	Mount	2	10u
6	Chip Capacitor	C16	GRM188B31E105KA75D	Murata	Mount	1	1u
7	Chip Capacitor	C4, C14	GRM188B31A475KE15D	Murata	Mount	2	4.7u
8	Chip Capacitor	C2, C3	GRM1885C1H4R0CA01D	Murata	Unmount	0	4p
9	Ceramic Capacitor	C7, C8	—	—	Unmount	0	
10	Right Angle Pin Socket	CN1	FSR-42085-08	Hirosugi-Keiki	Mount	1	16-pin(2x8), 2.54mm-pitch
11	Right Angle Pin Socket	CN2	FSR-42085-20	Hirosugi-Keiki	Mount	1	40-pin(2x20), 2.54mm-pitch
12	DC Jack	CN3	PJ-002AH-SMT	CUI inc	Mount	1	
13	Pin Socket	CN4	-	-	Unmount	0	4-pin(1x4), 2.54mm-pitch
14	E1 Connector	CN5	7614-6002PL	3M	Mount	1	
15	USB mini-B Receptacle	CN6	UX60A-MB-5ST	HIROSE ELECTRIC	Mount	1	
16	Diode	D1	GF1A-E3/67A	Vishay	Unmount	0	
17	Diode	D2	GF1A-E3/67A	Vishay	Mount	1	
18	Diode	D3	1N4148W-E3-18	Vishay	Mount	1	
19	リセッタブルヒューズ	F1	0ZCJ0050FF2G	Bel Fuse Inc	Mount	1	
20	Jumper	JP1	XG8S-0331	OMRON	Mount	1	3-pin
21	Jumper	JP2	XG8S-0231	OMRON	Mount	1	3-pin
22	Chip Ferrite Bead	L1	BLM18PG471SN1D	Murata	Mount	1	
23	LED	LED1	SML-512MWT86	ROHM	Mount	1	Grenn
24	LED	LED2	SML-511WWT86	ROHM	Mount	1	Yellow
25	LED	LED3, LED4	SML-511UWT86	ROHM	Mount	2	Red
26	Transistor	Q1, Q2, Q3	DTC114EKAT146	ROHM	Mount	3	
27	Chip Resistor	R1, R2, R4, R5, R47, R51, R52, R55, R57	MCR03EZPJ000	ROHM	Mount	9	0
28	Chip Resistor	R11-R46	MCR03ERTJ561	ROHM	Mount	36	560
29	Chip Resistor	R48, R49, R50, R56	MCR03ERTJ162	ROHM	Mount	4	1.6k
30	Chip Resistor	R59, R60	MCR03ERTJ104	ROHM	Mount	2	100k

No	Component Name		Component Specification			Qty/Set	Remarks
	Type	Reference	Product Number (Specfication)	Manufacture	Mount/Unmount		
31	Chip Resistor	R8	MCR03ERTJ103	ROHM	Mount	1	10k
32	Chip Resistor	R10, R61	MCR03ERTJ472	ROHM	Mount	2	4.7k
33	Chip Resistor	R3, R6, R7, R9, R53, R54, R58	-	ROHM	Unmount	0	
34	DIP Switch	SW1	SBS9102TK	KNITTER-SWITCH	Mount	1	2-position
35	Tact Switch	SW2-5	EVQQ2K02W	Panasonic	Mount	4	
36	CR2032 Battery Holder	V1	BK-5058	MPD	Unmount	0	
37	Crystal Oscillator	X1	SSP-T7-FL	SSI	Unmount	0	32.768kHz, CL=3.7pF, 20ppm
38	Crystal Unit	X2	—	—	Unmount	0	HC-49
39	Through Hole (Φ1mm)	TH1-4, TH6-TH11	—	—	Mount	10	
41	Through Hole (Φ0.5mm)	TH5, TH12-47	—	—	Mount	37	
40	PCB		RTK0EG0004C01002BJ REV.A		Mount	1	

Revision History	RX130 Group RX Capacitive Touch Evaluation System CPU Board User's Manual

Rev.	Date	Description	
		Page	
1.00	Feb 17, 2016	—	First Edition issued
1.10	Apr.26.24	—	Update Notice and How to Use This Manual.
		2	Added board dimensions to the Table 1.1
		3	Added regulatory compliance notices
		16	Update Code development.
		17	Update Additional Information.

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CPU Board User's Manual

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RX130 Group

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