User's Manual

32

RX261 Group

Renesas Solution Starter Kit
Capacitive Touch Evaluation System
User's Manual

RENESAS 32-Bit MCU

RX Family／RX200 Series

Renesas Electronics
www.renesas.com

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Corporate Headquarters

TOYOSU FORESIA, 3-2-24 Toyosu,
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The following usage notes are applicable to all Microprocessing unit and Microcontroller unit products from Renesas. For detailed usage notes on the products covered by this document, refer to the relevant sections of the document as well as any technical updates that have been issued for the products.

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 is a manual for users to understand the outline and hardware functions of the RX261 Group Capacitive Touch Evaluation System (RTK0EG0055S01001BJ). This manual is intended for users who use this CPU board. 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.

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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 JP4 (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 :2016/A1:2017/A2:2021	Group1 Class A	This product has no intentional external emissions, but internal RF emissions may affect nearby electromagnetically sensitive electronic equipment.
Radiated Emissions			
Conducted Emissions			

EMS: Electro Magnetic Susceptibility			
Standard		Level	Guidance for EMC protection
Radio Frequency Electromagnetic Field	EN IEC 61000-4-3:2020	A*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
Electrical Fast Transient / Burst	EN 61000-4-4:2012	B*2	
Surge	EN 61000-4-5 :2014/A1:2017	B*3	
Conducted Disturbance, Induced by Radio Frequency	EN 61000-4-6:2014	A*4	
Power Frequency Magnetic Field	EN 61000-4-8:2010	A*5	
Voltage Dips and Interruptions	EN IEC 61000-4-11:2020	B or C*6	

*1 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

*2 Test Condition of Electrical Fast Transient / Burst

Test Level	Wave Form	Repetition Frequency	Testing Duration	Result
±1.0kV	Rise time: 5.0nsec Pulse Duration: 50nsec	5kHz	60sec	Pass
		100kHz		Pass

*3 Test Condition of Surge

Test Level	Wave form Specification	Phase Angle	Result
±0.5kV	Front time: 1.2 / 8.0 μsec Time to half value: 50 / 20 μsec	0º, 90º,180º, 270º	Pass
			Pass

*4 Test condition of Conducted Disturbance, Induced by Radio Frequency

Test Level	Dwell Time	Modulation	Frequency Step	Result
3V (0.15MHz – 80MHz)	1.0 sec	1kHz AM 80%	1.0%	Pass

*5 Test Condition of Power Frequency Magnetic Field

Test Level	Applied Power Frequency	Test Duration	Result
3A/m (rms)	50Hz	60sec	Pass
	60Hz		Pass

*6 Test Condition of Voltage Dips and Interruptions

Test Item	Test Level	Duration	Phase Angle	Result
Voltage Dips	0%	0.5 cycles	0º, 180º	Pass
		1.0 cycles		Pass
	70%	25 cycles		Pass
Voltage Interruptions	0%	250 cycles		Pass

Table of Contents

1. Overview

1.1 Purpose

The RX261 Group Capacitive Touch Evaluation System (RTK0EG0055S01001BJ) is a kit created for evaluating the Renesas Electronics RX261 group of MCUs. This manual describes the RX261 Cap Touch evaluation System's hardware.

1.2 Main Characteristics and Features

The main functions of the RX261 Group Capacitive Touch Evaluation System are as follows:

- Renesas Microcontroller programming and debugging
  - E2 / E2 Lite debugger connector
- General purpose switches and LEDs
- Capacitive Touch Sensors (CTSU2SLa)
  - 34 channels available
- Connects to Renesas Capacitive Touch Evaluation System Application Board (option)
  - Includes self-capacitance touch electrode application board
- Pmod™ interface
  - PMOD1: Pmod Type 2A, Type 3A, and Type 6A
  - PMOD2: Pmod Type 2A

1.3 Board Specifications

Table 1-1. CPU Board Specifications

Item	Specifications
Board part No.	RTK0EG0054C01001BJ
MCU	Model No.: R5F52618BGFP
	Package: 100pin LFQFP
	On-chip memory: ROM 512KB, RAM 128KB, DataFlash 8KB
	High-speed on-chip oscillator: 64MHz maximum
External resonator connection	Main clock: 16MHz (option)
	Sub clock: 32.768KHz (option)
Power supply	Operation voltage: 5.0 to 3.3V ・DC jack (2.1mm Center Positive): 5.0V to 3.3 input ・USB bus powered (VBUS): 5V
Debug interface	Renesas Electronics E2/E2 Lite 14-pin box header
Slide switch	MCU operating mode selection: 2 poles x 4
Push switches	Reset switch: x 1
	User switches: x 2
LEDs	Power status: red x 1
	User LEDs: green x 1, yellow x 1
USB serial conversion interface	Connector: USB Type-C
	Driver: FT234XD USB serial IC manufactured by FTDI
Application board interface (GPIO)	2.54mm pitch, 16 pins x 1 (CN1)
Application board interface (CTSU)	2.54mm pitch, 40 pins x 1 (CN2)
Pmod interface	2.54mm pitch, 12 pins x 2 (PMOD1, PMOD2) ・ PMOD1: Pmod Type 6A (default state), Type 2A and Type 3A (with switch circuit) ・ PMOD2: Pmod Type 2A
Current consumption	500mA or less (total with all interfaces in use)
Operating Temperature Range	When operating: 10 to 35˚C, in storage: -10 to 50˚C (no condensation)
Board dimensions (L x W x H)	89mm x 95mm x 18mm (including connectors)

Table 1-2. Application Board Specifications

Item	Specifications
Board part No.	RTK0EG0019B01002BJ
Self-capacitance detection touch electrodes	Buttons: 3 Wheels: (4-electrode configuration): 1 Sliders: (5-electrode configuration): 1
Touch electrode shields	Buttons, wheel, slider: 1 shield each
LED	16
Renesas MCU Cap Touch CPU board interface	2.54mm pitch, 16 pins x 1 (CN1) 2.54mm pitch, 40 pins x 1 (CN2)
Overlay panel	2mm-thick acrylic panel
Current consumption	500mA or less
Operating Temperature Range	When operating: 10 to 35˚C, in storage: -10 to 50˚C (no condensation)
Board dimensions (L x W x H)	110mm x 116mm x 11mm (including connectors)

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 IEC 61326-1: 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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  - Manufacturer
    Name: Renesas Electronics Corporation
    Address: Toyosu Foresia, 3-2-24, Toyosu, Koto-ku, Tokyo 135-0061, Japan
  - Person responsible for placing on the market
    Name: Renesas Electronics Europe GmbH
    Address: Arcadiastrasse 10, 40472 Dusseldorf, Germany
  - Trademark and Type name
    Trademark: Renesas
    Product name: RX261 Group Capacitive Touch Evaluation System
    Type name: RTK0EG0055S01001BJ

Environmental Compliance and Certifications:

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

2. CPU Board

2.1 System Block Diagram

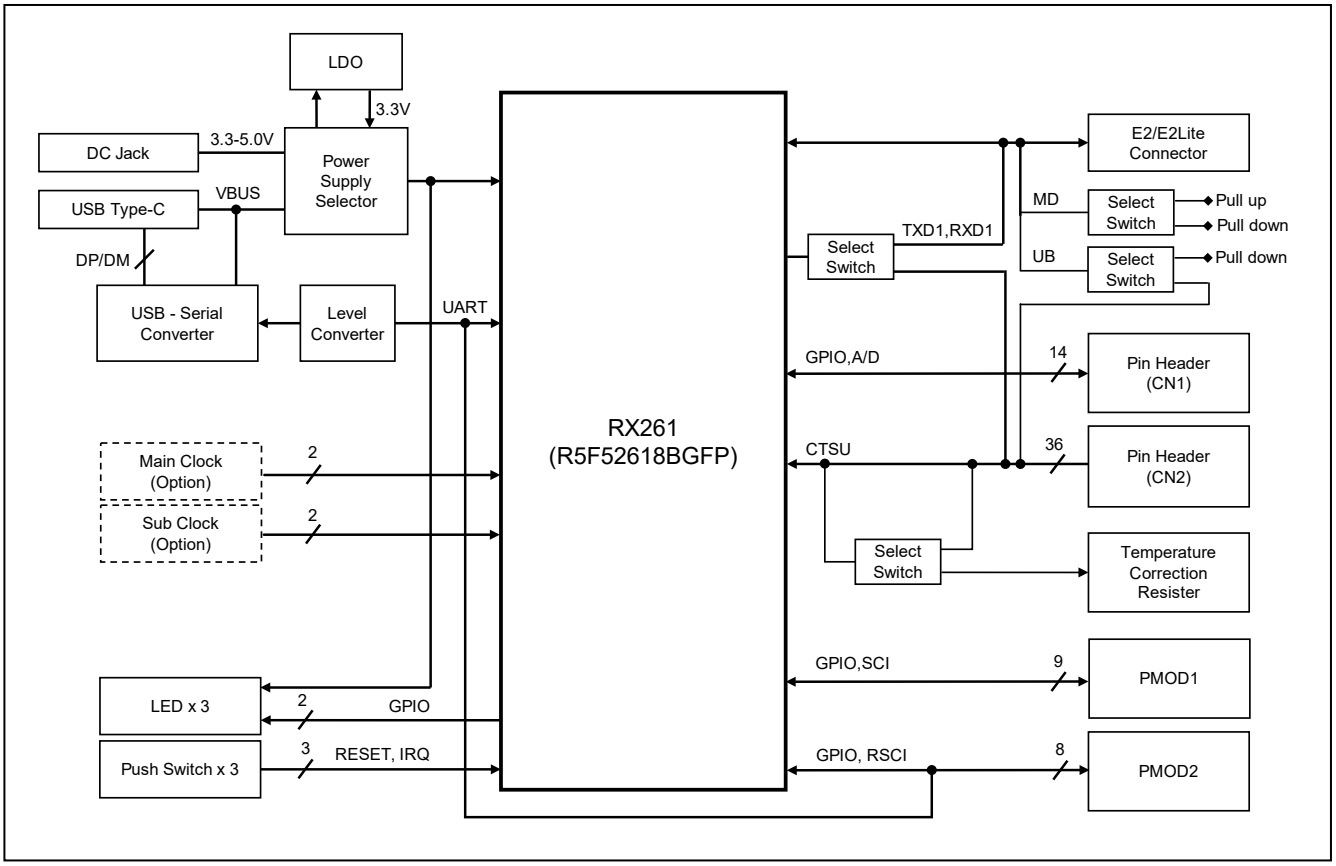


Figure 2-1. System Block Diagram

2.2 Product Configuration

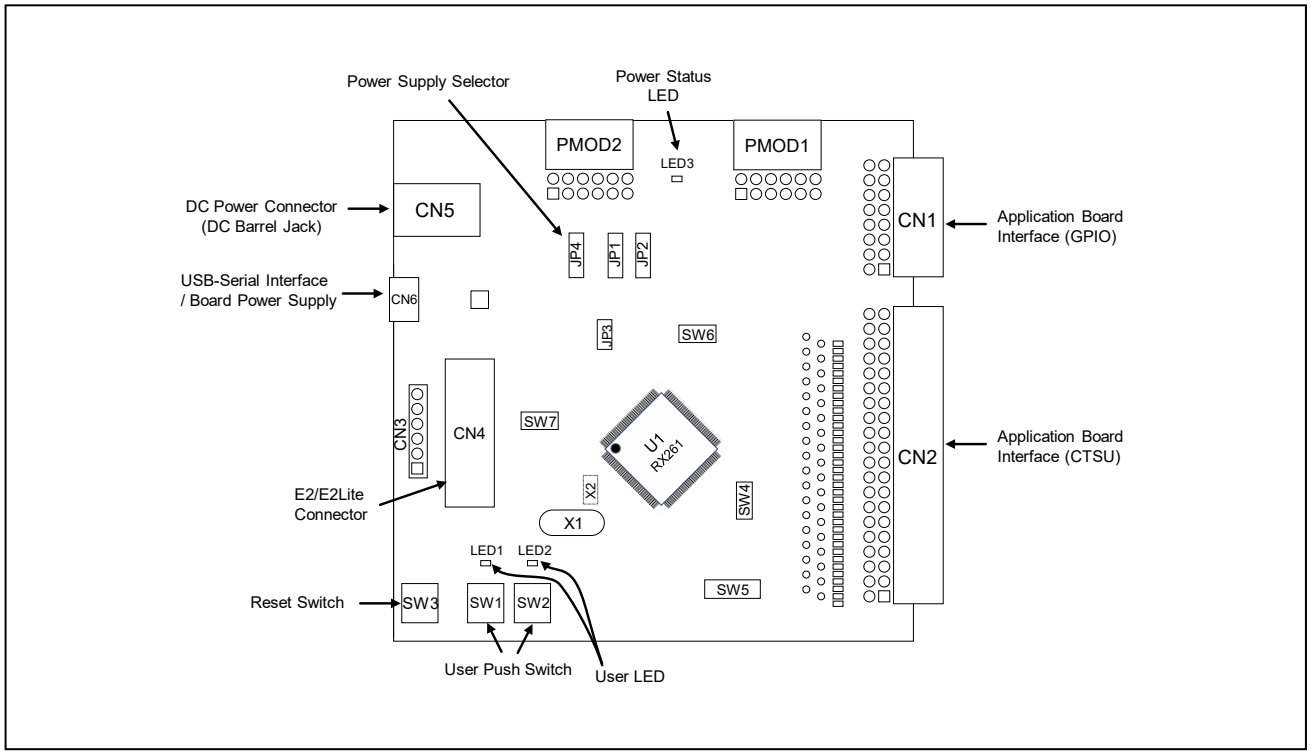


Figure 2-2. Parts Locations

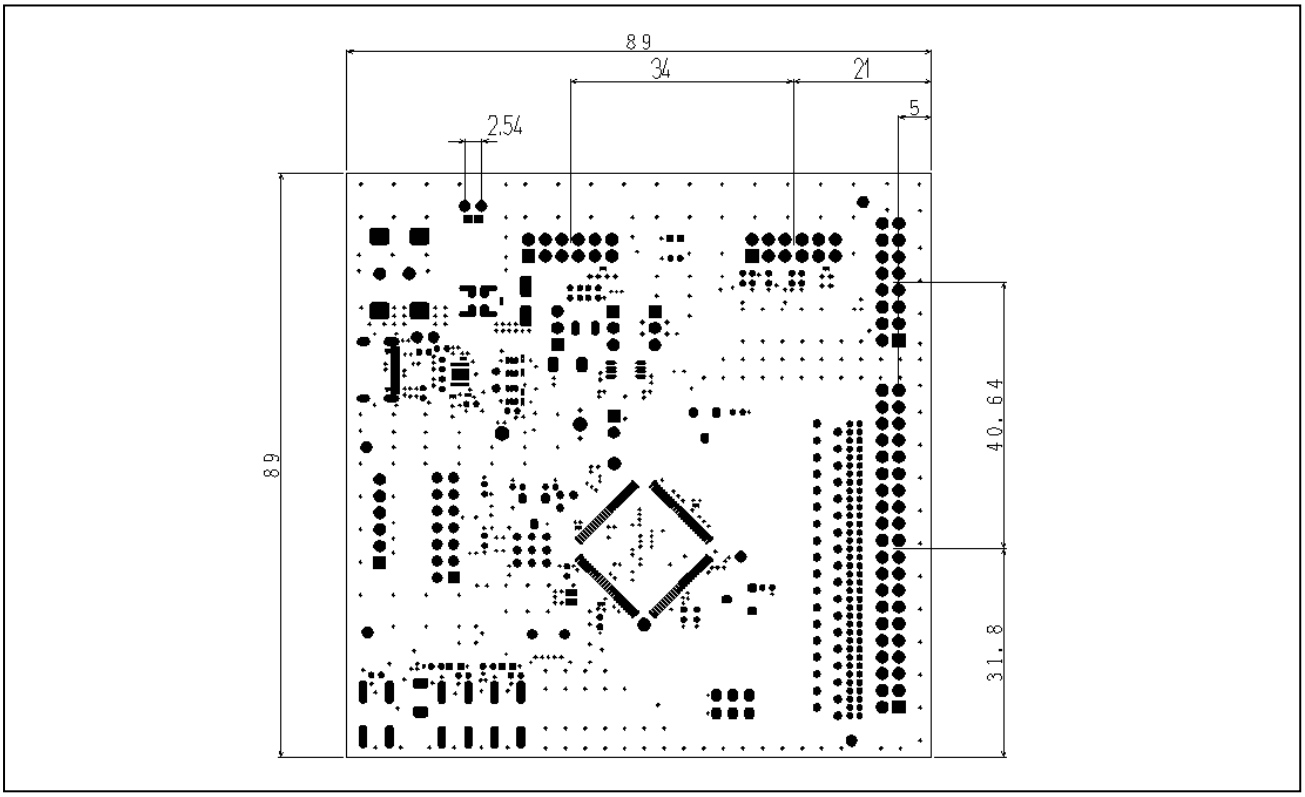


Figure 2-3. Board Dimensions

2.3 Hardware Details

2.3.1 Default Board Settings

This section describes the default state of the jumper switches and slide switches.

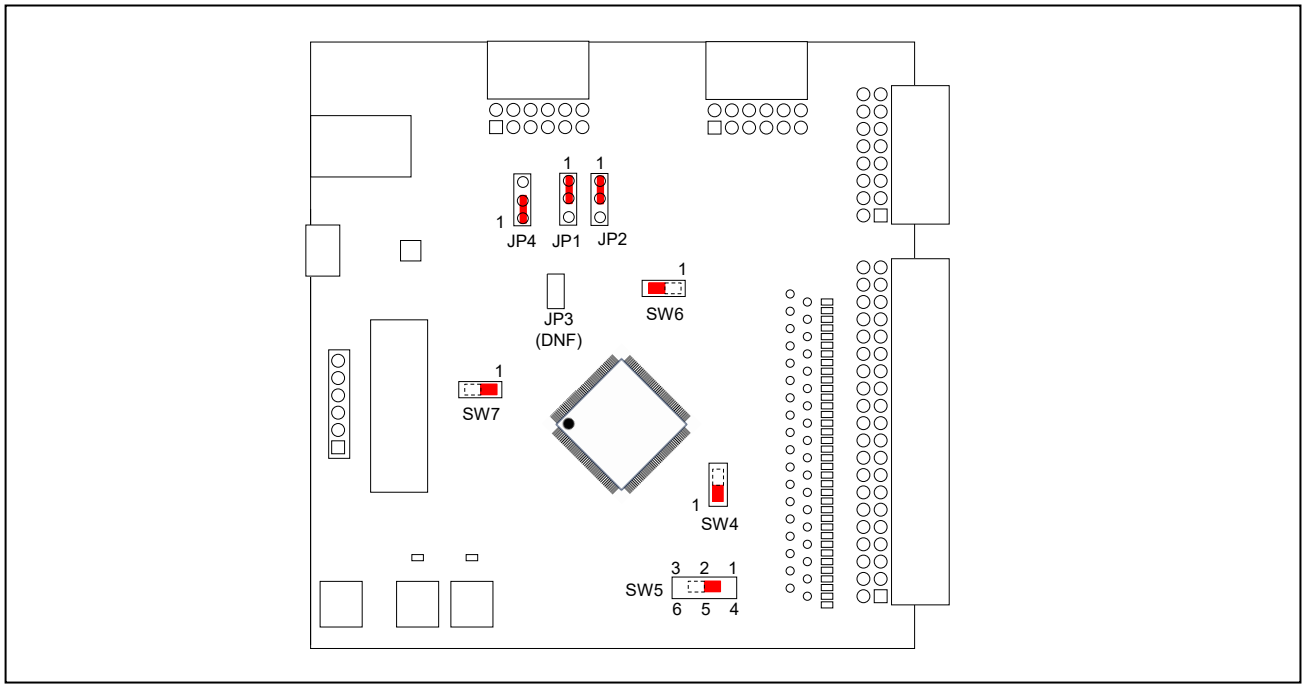


Figure 2-4. Default Positions of Jumper and Slide Switches

Table 2-1. Default Settings for Jumper and Slide Switches

Reference	Circuit Group	Default State	Description
JP4	Power supply setting (USB or DC jack)	Supplied from USB	2.3.2 Power Supply
JP1, 2	3.3V LDO ON/OFF	OFF	
SW4	RX261 pin (UB/TS13) connection setting (CN2 or pull-down)	CN2	2.3.4 Reset Circuit / Debug Interface
SW5	RX261 pin (TXD1/TS4, RXD1/TS2) connection setting (CN2 or CN4)	CN2	
SW6	RX261 pin (TS35) connection setting (pull-down or CN2)	CN2	2.3.8 CTSU Correction Circuit
SW7	RX261 pin (MD/FINE) connection setting (pull-up or pull-down or CN2)	Pull-up	2.3.4 Reset Circuit / Debug Interface

2.3.2 Power Supply

This section describes the power supply and selection method.

Power can be supplied via USB or DC jack (2.1mm center plus).

Table 2-2. Power Source Jumper Settings

Reference	Jumper Setting	Default Setting (X)	Description
JP4	Shorted Pins 1-2	X	Supplies USB power source to power supply selector B (JP1, JP2)
	Shorted Pins 2-3		Supplies DC jack (CN5) to power supply selector B (JP1, JP2)
JP1, JP2	Shorted Pins 1-2	X	Supplies JP4 power source to board power source
	Shorted Pins 2-3		Supplies LDO (3.3V) to board power source
JP3 / PAD3	Shorted Pins 1-2	X	Supplies board power source to MCU
	Open		For measuring MCU current consumption

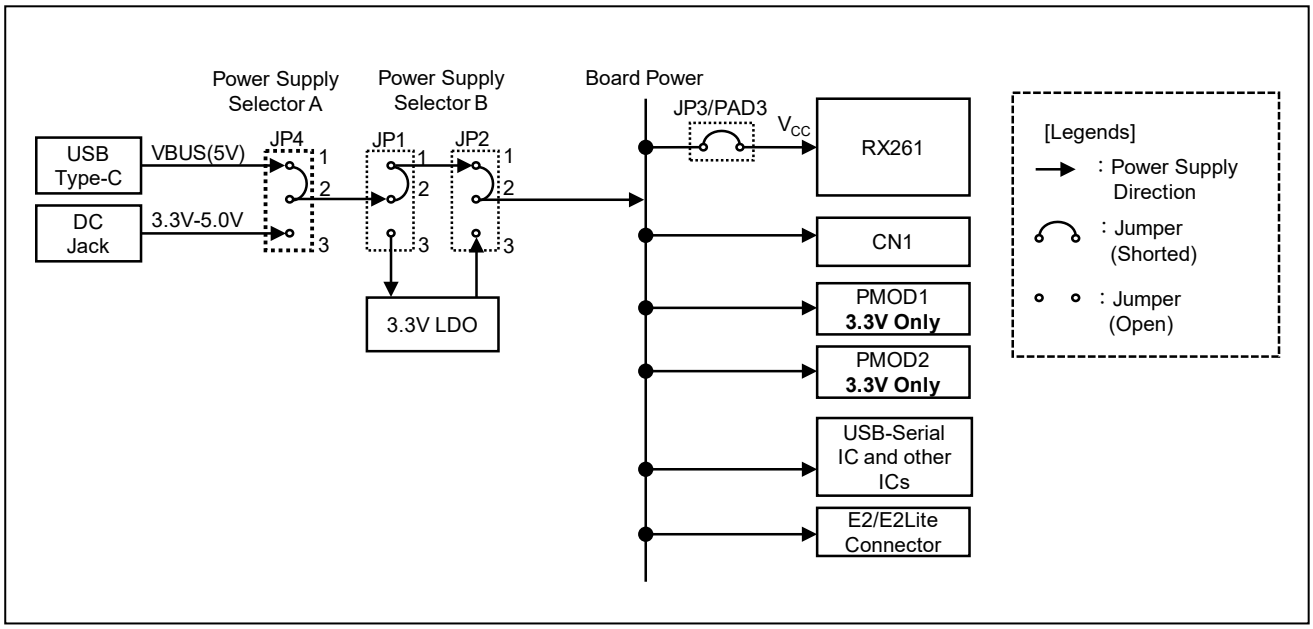


Figure 2-5. Power Source System Diagram

2.3.3 Clock Circuit

Table 2-3. Clock Specifications

Clock	Function	Default State	Frequency	Package
X1	Main clock (crystal resonator)	Not mounted	16MHz	HC-49/S
X2	Sub clock	Not mounted	32.768kHz	2.00mm x 1.20mm SMD

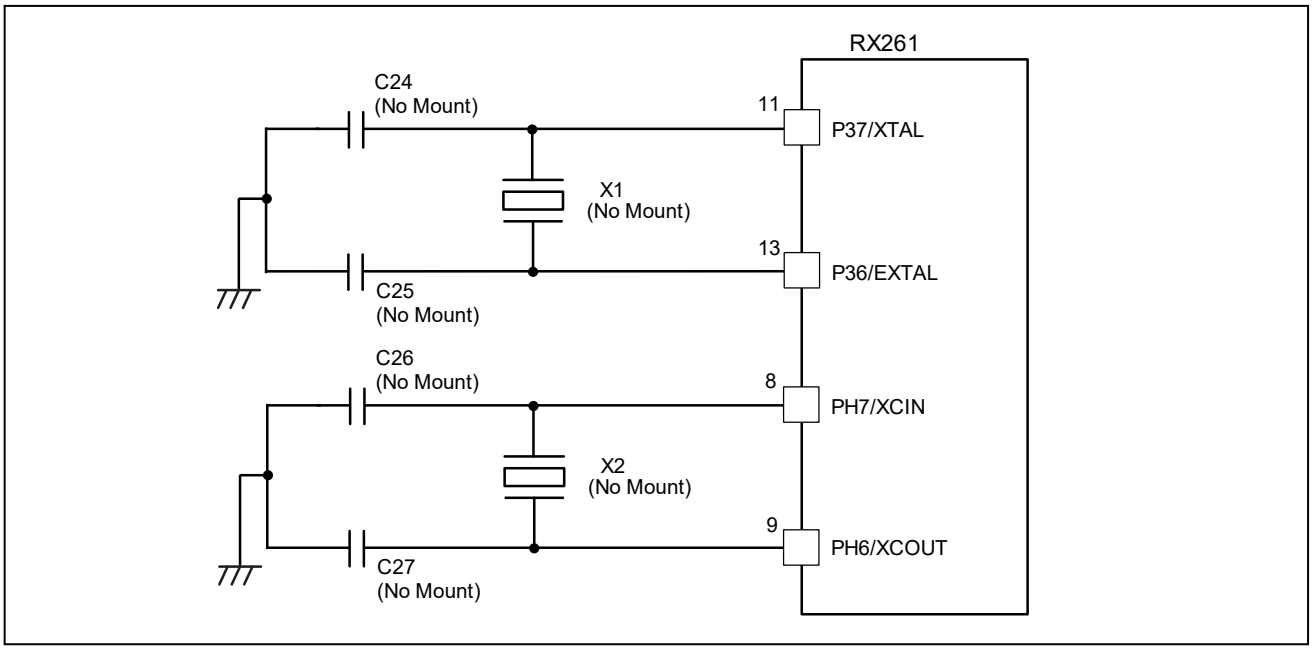


Figure 2-6. Clock Circuit

2.3.4 Reset Circuit / Debug Interface

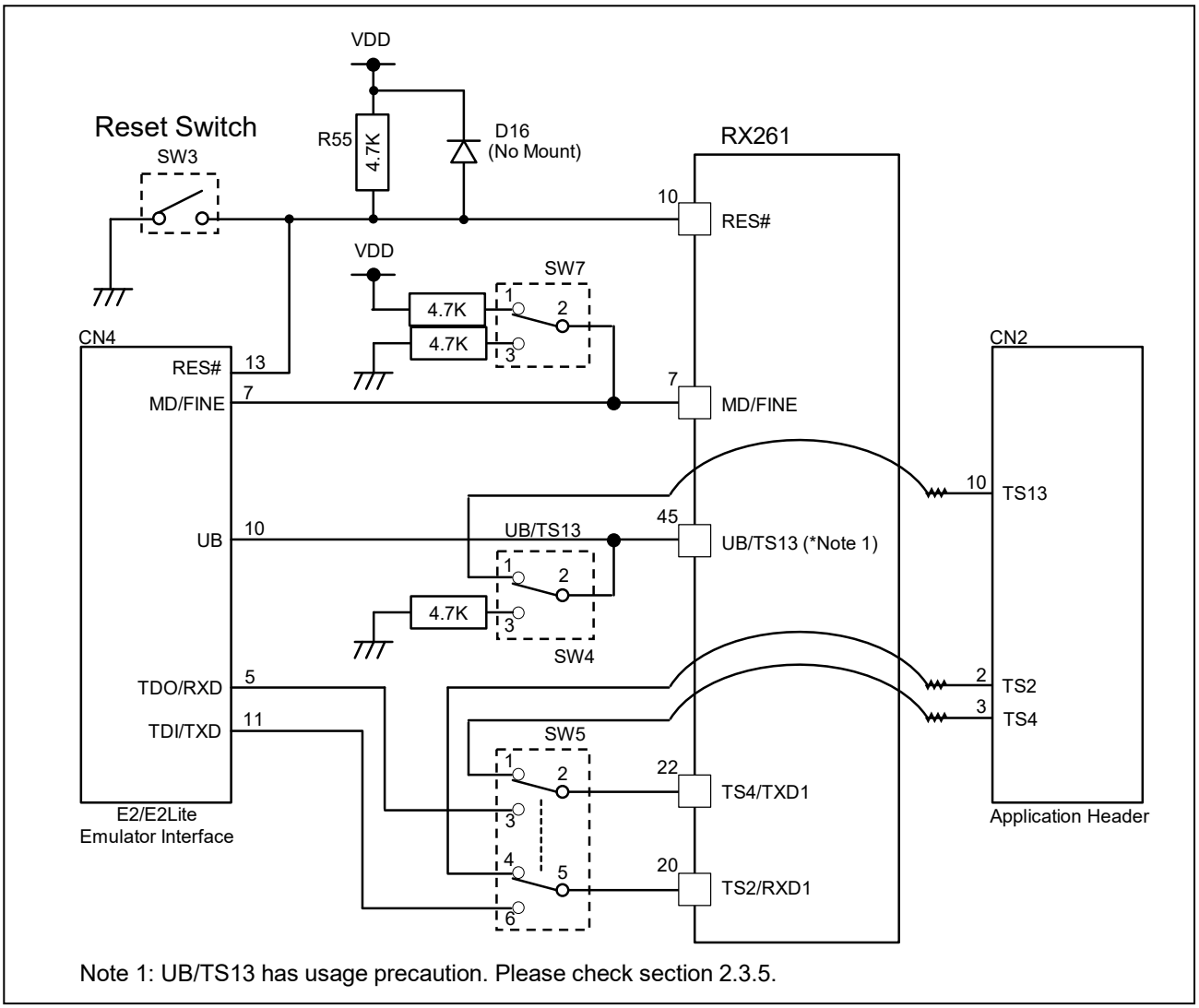
The RX261 CPU Board is equipped with a reset switch (SW3) which generates a reset signal to restart the main MCU.

The following figure shows the connection between the RX261 and the debug interface connector (CN4).

For details on the debug interface, refer to section [2] of 4 Reference Materials.

Table 2-4. Function Selection Switch (SW4, 5, 7) Specifications

Reference	Position	Default State (X)	Function
SW4	Shorted Pins 1-2	X	Connects UB/TS13 to CN2 (TS13)
	Shorted Pins 2-3		Pulls down UB/TS13
SW5	Shorted Pins 1-2 Shorted Pins 4-5	X	Connects TS4/TXD1 to CN2 (TS4) Connects TS2/RXD1 to CN2 (TS2)
	Shorted Pins 2-3 Shorted Pins 5-6		Connects TS4/TXD1 to CN4 (TXD1) Connects TS2/RXD1 to CN4 (RXD1)
SW7	Shorted Pins 1-2	X	Pulls up MD/FINED
	Shorted Pins 2-3		Pulls up MD/FINED



Note 1: UB/TS13 has usage precaution. Please check section 2.3.5.

Figure 2-7. Reset Circuit / Debug Interface

2.3.5 TS13 Usage Precaution

When using TS13 with the touch function, make sure TS13 is not connected to the emulator when generating touch software with QE for Capacitive Touch. (Use the tuning function via a serial connection to QE.)

When the emulator is connected to TS13, parasitic capacitance the emulator connection is added the board capacitance of the board itself. If touch software is generated in this state, the parameters related to the parasitic capacitance (initial value of the sensor offset) will be set to values larger than when using the board alone. If the board is operated independently with these initial values, an error may occur during initial offset tuning after reset is released.

UB and TS13 share one pin (UB/TS13) on the RX261. UB is connected to the emulator connector (CN4) on the board to enable control by the emulator. TS13 is connected to TS-B2 (button electrode) on the self-capacitance electrode board included with this product.

2.3.6 Push Switches / LEDs

Table 2-5. Push Switch Specifications

Reference	MCU Control Port	Function
SW3（Reset）	RES#	Resets the MCU
SW1	PE6	User controllable switch
SW2	PE5	User controllable switch

Table 2-6. LED Functions and Connections

LED	MCU Control Port	Function	Color
LED3 (Power)	VCC	Power status display	Red
LED1	P25	User controllable LED	Green
LED2	P24	User controllable LED	Yellow

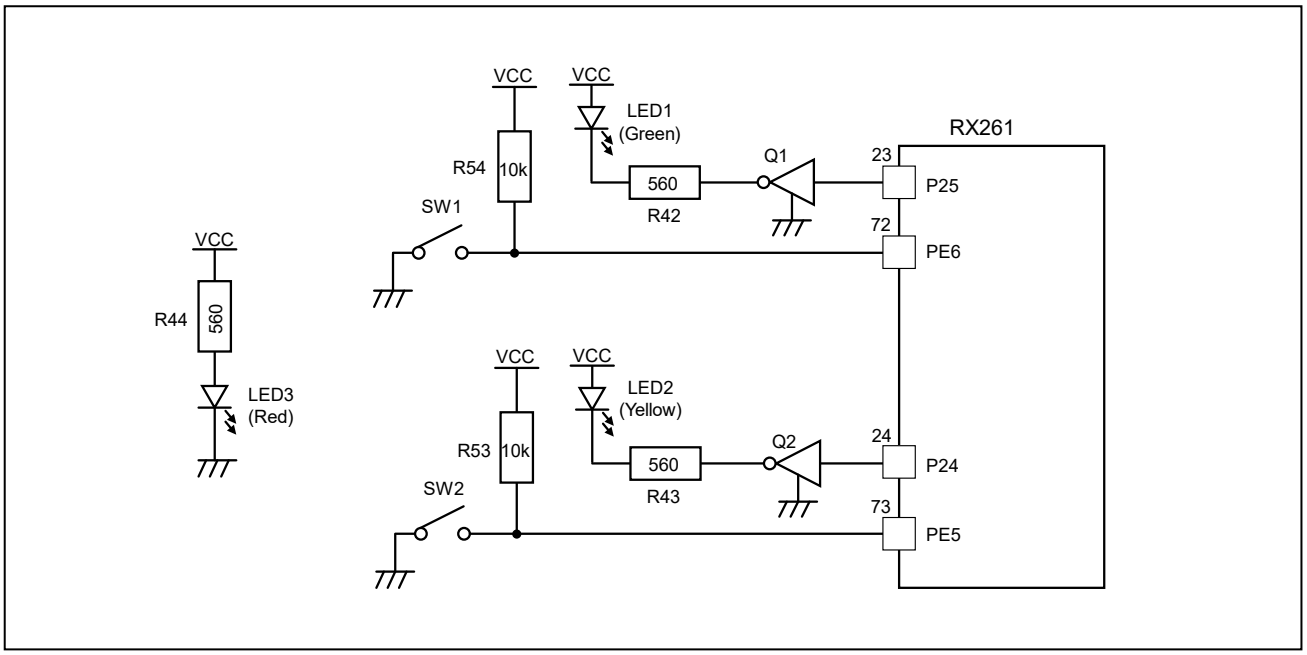


Figure 2-8. Push Switch/LED Circuit

2.3.7 USB Serial Converter

The CPU board is equipped with an FTDI USB serial IC (FT234XD) and is connected to the RX261's serial communications interface (RSCI).

The MCU port used for this function is also used for PMOD2, which can be switched by changing the resistor. by mounting a resistor. The default state is USB serial conversion.

Table 2-7. USB Serial Conversion Ports

Signal Name	MCU Port	Function
MCU_TXD	P20/TXD000	Transmit data signal
MCU_RXD	P21/RXD000	Receive data signal

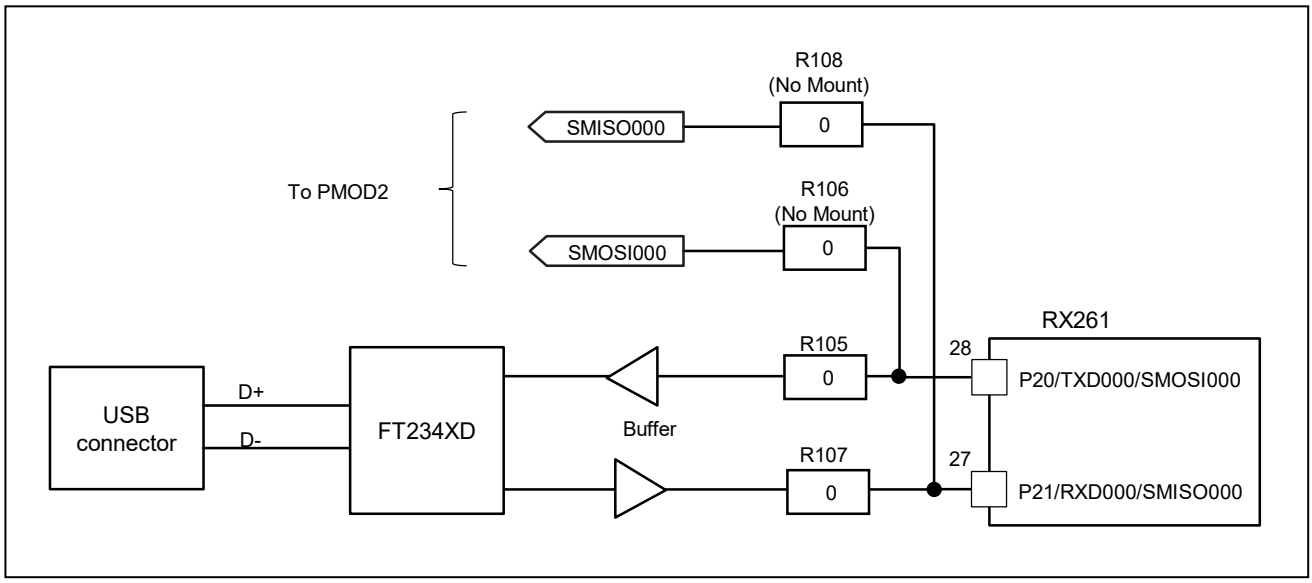


Figure 2-9. Interface for MCU and USB Serial Conversion Circuit

2.3.8 CTSU Correction Circuit

This circuit improves the absolute accuracy of the CTSU's capacitive measurement. The resistor and control software required for the CTSU correction function are sold separately. When using TS35 as a normal CTSU pin, set the position to 2-3 Short.

Table 2-8. Board Function Selection Switch (SW6) Specifications

Reference	Position	Default State (X)	Function
SW6	2-3 Short	X	Uses TS35 as a normal CTSU pin
	1-2 Short		Uses TS35 as a CTSU correction pin Pulls down TS35 with a 10kΩ resistor.

2.3.9 Pmod Interface

This CPU board is equipped with 2 Pmod interface connectors (PMOD1, PMOD2).

PMOD1 can be selected for Pmod Type 2A, Type 3A, and Type 6A. Make the selection by changing the mounting of the 0Ω resistor (Figure 2-10). The default setting is Type 6A.

PMOD2 can be used for Pmod Type 2A, but you will need to switch to the USB Serial Converter. Switch by changing the mounting of the 0Ω resistor (Figure 2-11). The default setting is USB Serial Converter.

When connecting the Pmod module, check the pin positions and be careful not to misalign the positions or insert the pins backwards. Incorrect pin insertion can cause the product to malfunction.

Table 2-9. PMOD1 Pin Assignments (Default Type 6A)

Pin	Function (Type)			MCU Port
	2A	3A	6A	
1	CS	CTS	NC	**[2A]** PJ3/CTS6#/RTS6#/SS6# **[3A]** PE7/IRQ7 **[6A]** (Not relevant)
2	MOSI	TXD	NC	**[2A,3A]** PD0/TXD6/SMOSI6/SSDA6 **[6A]** (Not relevant)
3	MISO	RXD	SCL	**[2A,3A,6A]** P33/RXD6/SMISO6/SSCL6
4	SCK	RTS	SDA	**[2A]** P34/SCK6 **[3A]** PJ3/CTS6#/RTS6#/SS6# **[6A]** PD0/TXD6/SMOSI6/SSDA6
5	GND			–
6	VCC			–
7	GPIO			PD7
8	GPIO			PD6
9	GPIO			PD5
10	GPIO			PD4
11	GND			–
12	VCC			–

Table 2-10. PMOD2 Pin Assignments

Pin	Function (Type)			MCU Port
	2A	3A	6A	
1	CS	Not supported		**[2A]** P23/SS000#
2	MOSI			**[2A]** P20/TXD000/SMOSI000
3	MISO			**[2A]** P21/RXD000/SMISO000
4	SCK			**[2A]** P22/SCK000
5	GND			–
6	VCC			–
7	GPIO			PD3
8	GPIO			PD2
9	GPIO			PD1
10	GPIO			P53
11	GND			–
12	VCC			–

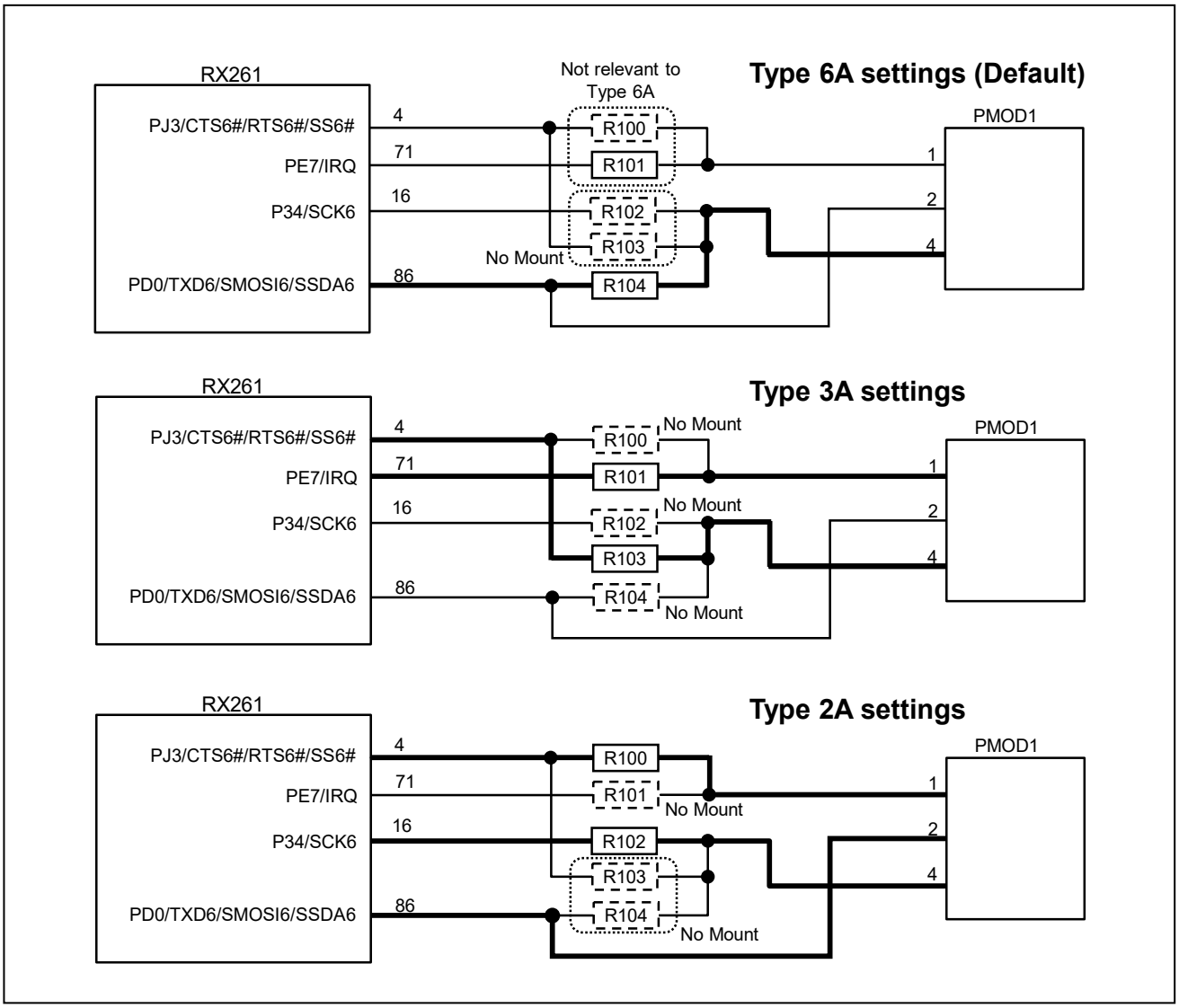


Figure 2-10. PMOD1 Interface Switch Circuit

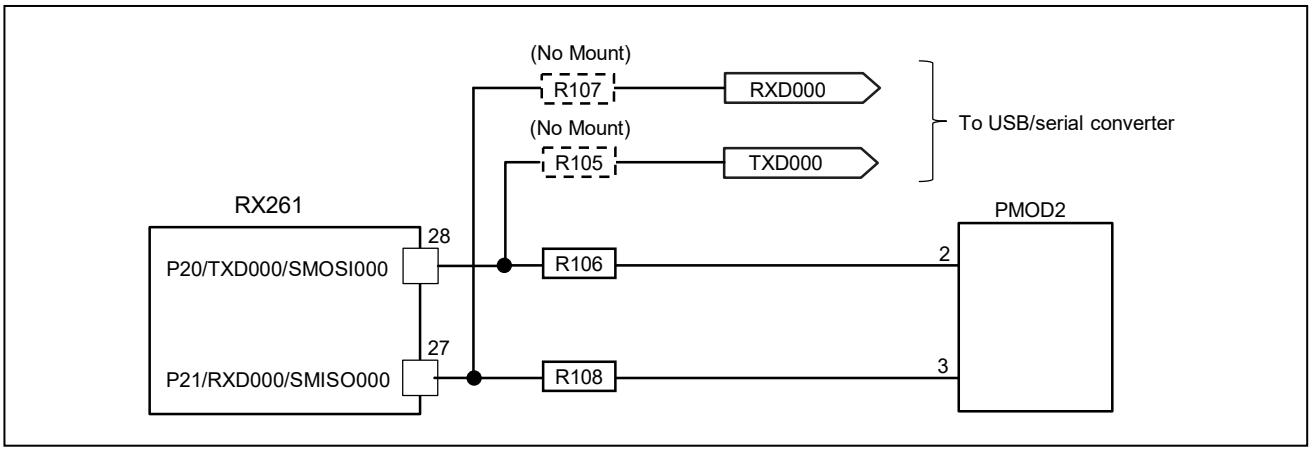


Figure 2-11. PMOD2 Interface Switch Circuit

2.3.10 Application Headers

Application headers CN1 and CN2 are the interface connections for connecting the user's board to the Renesas Capacitive Touch Evaluation System CPU board.

CN1 is equipped with the GPIO interface. For peripheral functions not mentioned in the table below, refer to the target MCU's user's manual (hardware version).

Table 2-11. Application Headers (CN1)

CN1	MCU		CN1	MCU	
Pin	Port	Peripheral	Pin	Port	Peripheral
16	VSS (GND)	—	15	VCC	—
14	P13	—	13	P12	—
12	P52	—	11	P51	—
10	P16	—	9	P45	—
8	P46	—	7	P50	—
6	PA7	—	5	PE1	—
4	PE0	—	3	P47	—
2	PJ1	—	1	P17	—

CN2 is mainly used for CTSU pins. Fix the GPIO pins to low by software.

Table 2-12. Application Header (CN2)

CN2	MCU		CN2	MCU	
Pin	Port	CTSU	Pin	Port	CTSU
40	—	—	39	—	—
38	—	—	37	—	—
36	PE2	TS35 (Note1)	35	PE3	TS34
34	PE4	TS33	33	PA0	TS32
32	PA1	TS31	31	PA2	TS30
30	PA3	TS29	29	PA4	TS28
28	PA5	TS27	27	PA6	TS26
26	PB0	TS25	25	PB1	TS24
24	PB2	TS23	23	PB3	TS22
22	PB4	TS21	21	PB5	TS20
20	PB6	TS19	19	PB7	TS18
18	PC2	TS17	17	PC3	TS16
16	PC5	TS15	15	PC6	TS14
14	PH0	TS10	13	USB0_DM (Note2)	—
12	USB0_DP (Note2)	—	11	PH3	TS7
10	PC7	TS13 (Note3)	9	P54	TS12
8	P55	TS11	7	P14	TS6
6	P15	TS5	5	P27	TS3
4	P31	TS1	3	P26	TS4 (Note4)
2	P30	TS2 (Note4)	1	P32	TS0

— : Not Applicable

Note1 : TS35 can be switched by SW6. For details, see 2.3.8 CTSU Correction Circuit.
Note2 : Pins 12 and 13 are the signals for board testing. Do not use.
Note3 : TS13 can be switched by SW4. For details, see 2.3.4 Reset Circuit / Debug Interface.
Note4 : TS2 and TS4 can be switched by SW5. For details, see 2.3.4 Reset Circuit / Debug Interface.

3. Application Board (Self-Capacitance Electrode Board)

3.1 Board Layout

Figure 3-1 shows the layout of the application board.

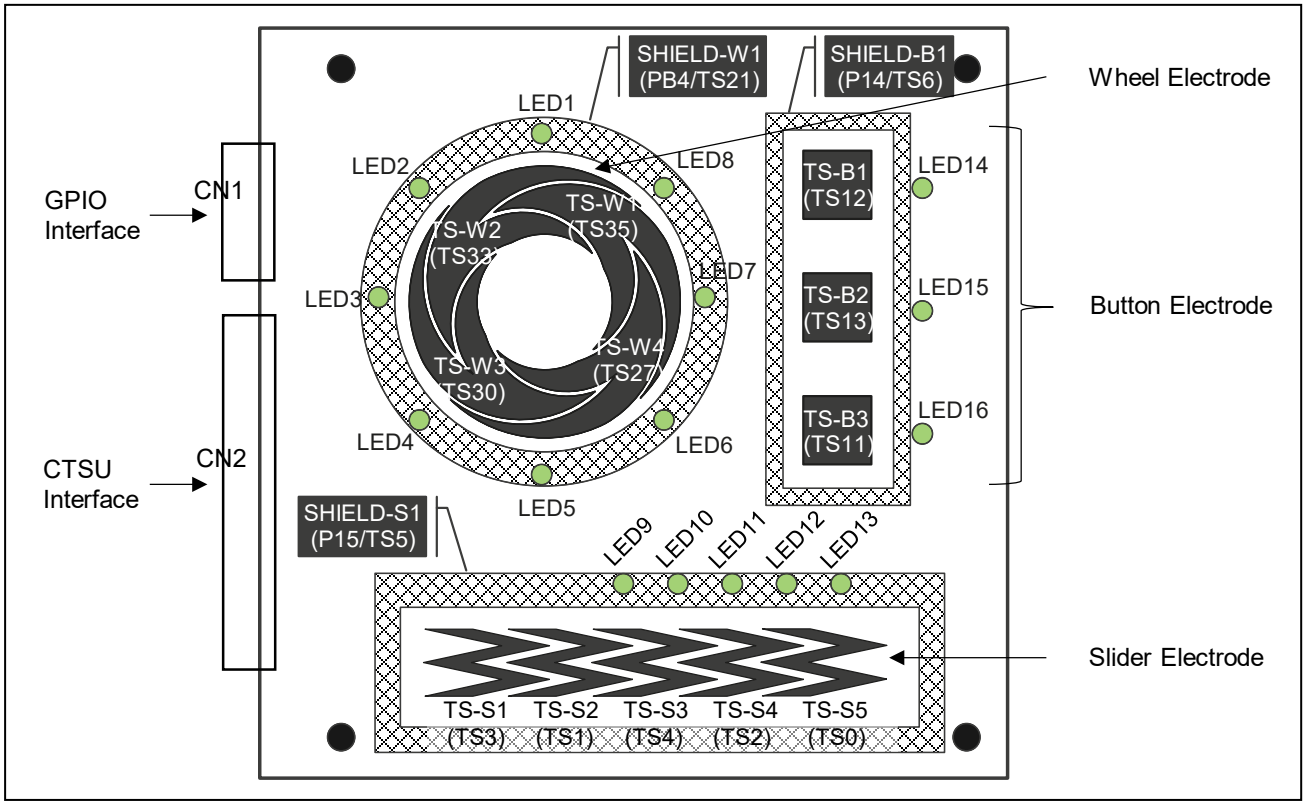


Figure 3-1. Application Board Layout

3.2 Application Headers

Application headers CN1 and CN2 are the interface for connection to the Renesas Capacitive Touch Evaluation System CPU board. Table 3-1 lists the pin assignments for CN1. Table 3-2 lists the pin assignments for CN2.

Table 3-1. Application Header (CN1)

Pin	Function	MCU Connection	Pin	Function	MCU Connection
15	LED_VCC	VCC	16	LED_VSS (GND)	VSS (GND)
13	LED_ROW0	P12	14	LED_ROW1	P13
11	LED_ROW2	P51	12	LED_ROW3	P52
9	—	—	10	—	—
7	LED_COL3	P50	8	—	—
5	LED_COL1	PE1	6	LED_COL2	PA7
3	—	—	4	LED_COL0	PE0
1	—	—	2	—	—

— : Not Applicable

Table 3-2. Application Header (CN2)

Pin	Touch Electrode	CTSU (RX261) **(Note1)**	Pin	Touch Electrode	CTSU (RX261) **(Note1)**
39	–	–	40	–	–
37	–	–	38	–	–
35	–	–	36	TS-W1	TS35
33	–	–	34	TS-W2	TS33
31	TS-W3	TS30	32	–	–
29	–	–	30	–	–
27	–	–	28	TS-W4	TS27
25	–	–	26	–	–
23	–	–	24	–	–
21	–	–	22	SHIELD-W1	TS21 (Note2)
19	–	–	20	–	–
17	–	–	18	–	–
15	–	–	16	–	–
13	–	–	14	–	–
11	–	–	12	–	–
9	TS-B1	TS12	10	TS-B2	TS13 (Note3)
7	SHIELD-B1	TS6 (Note2)	8	TS-B3	TS11
5	TS-S1	TS3	6	SHIELD-S1	TS5 (Note2)
3	TS-S3	TS4	4	TS-S2	TS1
1	TS-S5	TS0	2	TS-S4	TS2

– : Not Applicable

Note 1: Set output of all unassigned pins to low by software.

Note 2: SHIELD-S1, SHIELD-W1 and SHIELD-B1 are shield electrodes. To enable these functions, set the pins to low by software.

Note 3: Refer to section 2.3.5 TS13 Usage Precaution.

Table 3-3. LED Matrix Table

	LED_COL0	LED_COL1	LED_COL2	LED_COL3
LED_ROW0	LED1	LED5	LED13	LED9
LED_ROW1	LED2	LED6	LED14	LED10
LED_ROW2	LED3	LED7	LED15	LED11
LED_ROW3	LED4	LED8	LED16	LED12

Table 3-4. LED Status and Pin Output Settings

LED	LED_ROWn Connection Pin	LED_COLn Connection Pin
On	Low	High
Off	High	Low

Note: n=0~3.

4. Reference Materials

[1]. Renesas RX260/ RX261 Group User's Manual: Hardware (R01UH1045)
[2]. E1/E20/E2 Emulator, E2 Emulator Lite Additional Document for User's Manual (Notes on Connection of RX Devices) (R20UT0399)

5. Additional Information

Support

Refer to the Integrated Development Environment help menu for more information on how to use the IDE.

Refer to the RX260, RX261 Group User's Manual Hardware Version for more information on RX261 Group MCUs.

For online technical support and information, visit: https://www.renesas.com/support/contact.html

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

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