User's Manual

32

RX671 Group

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

RENESAS 32-Bit MCU

RX Family／RX600 Series

Renesas Electronics
www.renesas.com

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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 RX671 Group Capacitive Touch Evaluation System (RTK0EG0044S01001BJ). 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 61000-4-3: 2006/A1:2008/A2:2010	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 RX671 Group Capacitive Touch Evaluation System (RTK0EG0044S01001BJ) is a kit created for evaluating the Renesas Electronics RX671 Group of MCUs. This manual describes the RX671 Cap Touch Evaluation System's hardware.

1.2 Main Characteristics and Functions

The main functions of the RX671 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 Sensor (CTSUa)
  - 17 channels available
- Pmod™ interface
  - PMOD1: Pmod Type 2A, Type 3A, and Type 6A
  - PMOD2: Pmod Type 2A
- Connects to Renesas Capacitive Touch Evaluation System Application Board (option)
  - Includes self-capacitance touch electrode application board

1.3 Board Specifications

Table 1-1 CPU Board Specifications

Item	Specifications
Board part No	RTK0EG0043C01001BJ
MCU	Model No.: R5F5671EHDFP
	Package: 100pin LFQFP
	On-chip memory: ROM 2MB, RAM 384KB, DataFlash 8KB
	High-speed on-chip oscillator (HOCO): Selectable from 16MHz, 18MHz, and 20MHz
External resonator connection	Main clock: 12MHz (option)
	Sub clock: 32.768KHz (option)
Power supply	Operation voltage: 5.0V • DC jack (2.1mm Center Positive): 5.0V input • USB bus powered (VBUS): 5V Board Device Porer: 3.3V • Voltage regulator (LDO): 3.3V
Debug interface	Renesas Electronics E2/E2 Lite 14-pin box header
Slide switch	MCU operating mode selection: 1 pole x 1 TS pins / SCI Boot Mode programming pins switch: 2 poles x 1, 1 pole x 1
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 Micro B
	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: Pmod Type 2A, Type3A, Type 6A (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 Wheel (4-electrode configuration): 1 Sliders (5-electrode configuration): 1
Touch electrode shields	Button, wheel, and slider areas: 1 shield each
LEDs	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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    Address: Arcadiastrasse 10, 40472 Dusseldorf, Germany
  - Trademark and Type name
    Trademark: Renesas
    Product name: RX671 Group Capacitive Touch Evaluation System
    Type name: RTK0EG0044S01001BJ

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 shows the system block diagram of the CPU board.

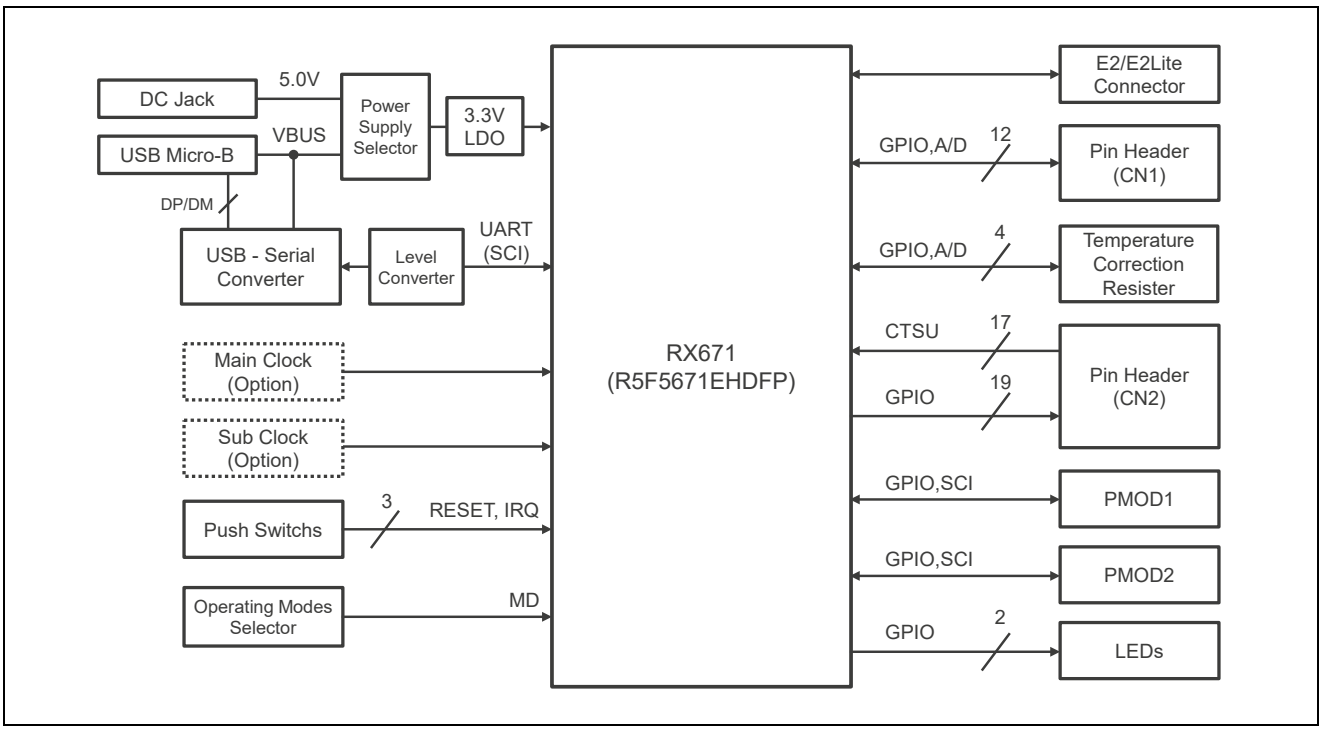


Figure 2-1. System Block Diagram

2.2 Product Configuration

Figure 2-2 shows the parts location. Figure 2-3 shows the board dimensions.

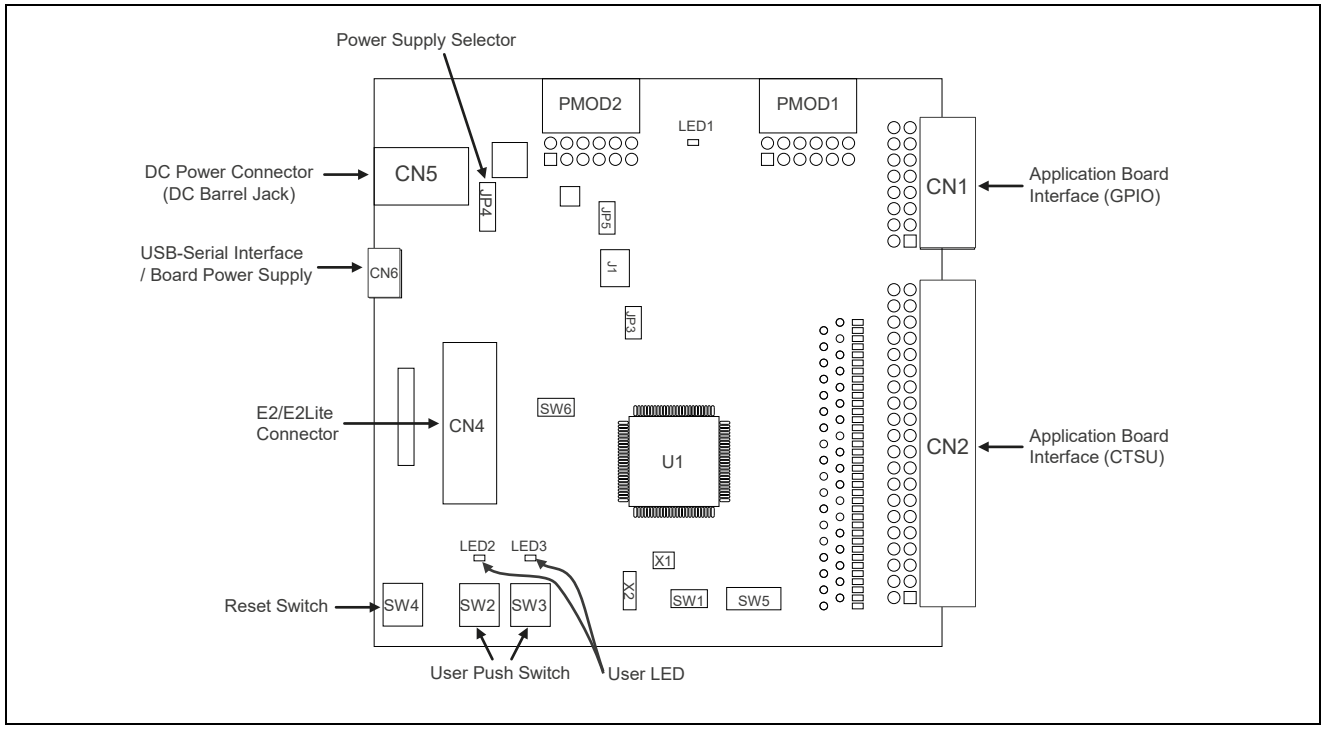


Figure 2-2. Parts Location

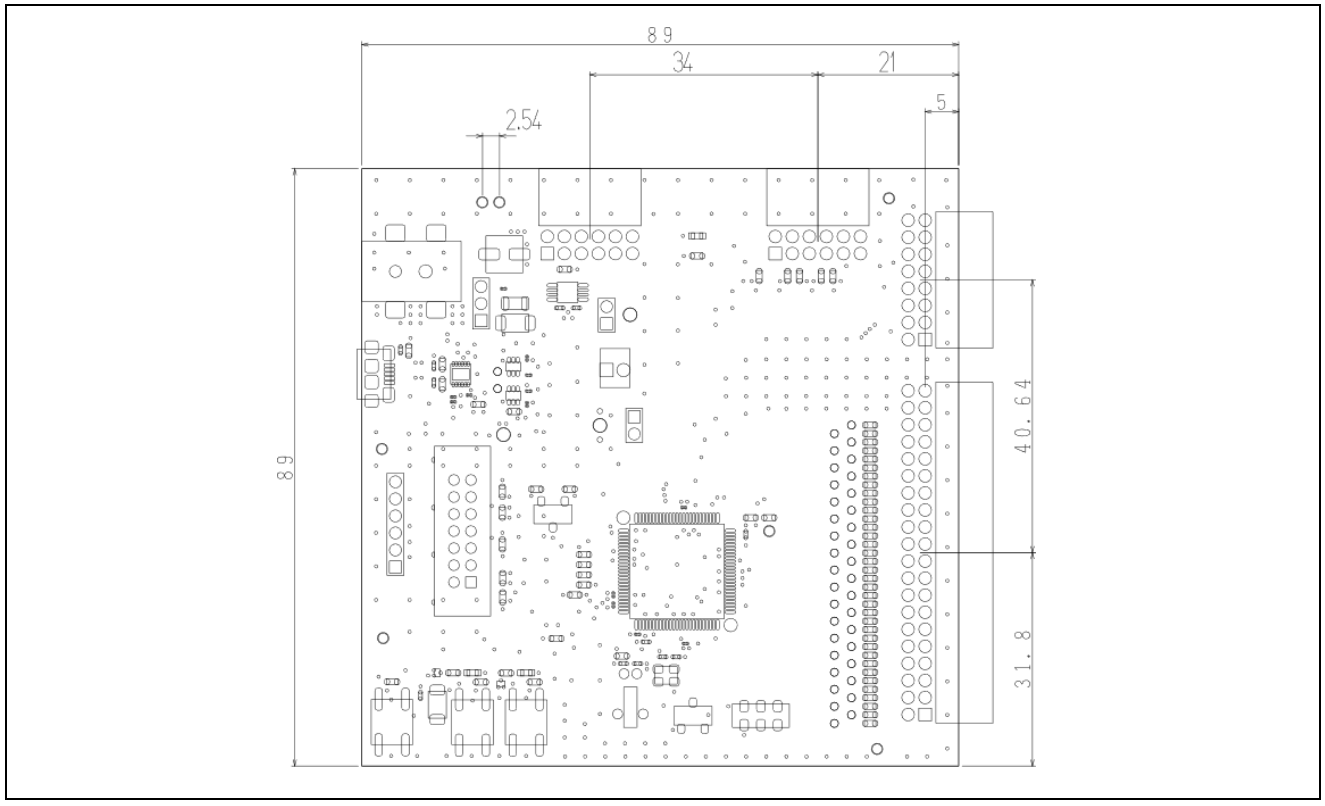


Figure 2-3. Board Dimensions

2.3 Hardware Details

2.3.1 Default Jumper Settings

Figure 2-4. shows the default positions of the jumpers.Table 2-1 lists the default jumper settings.

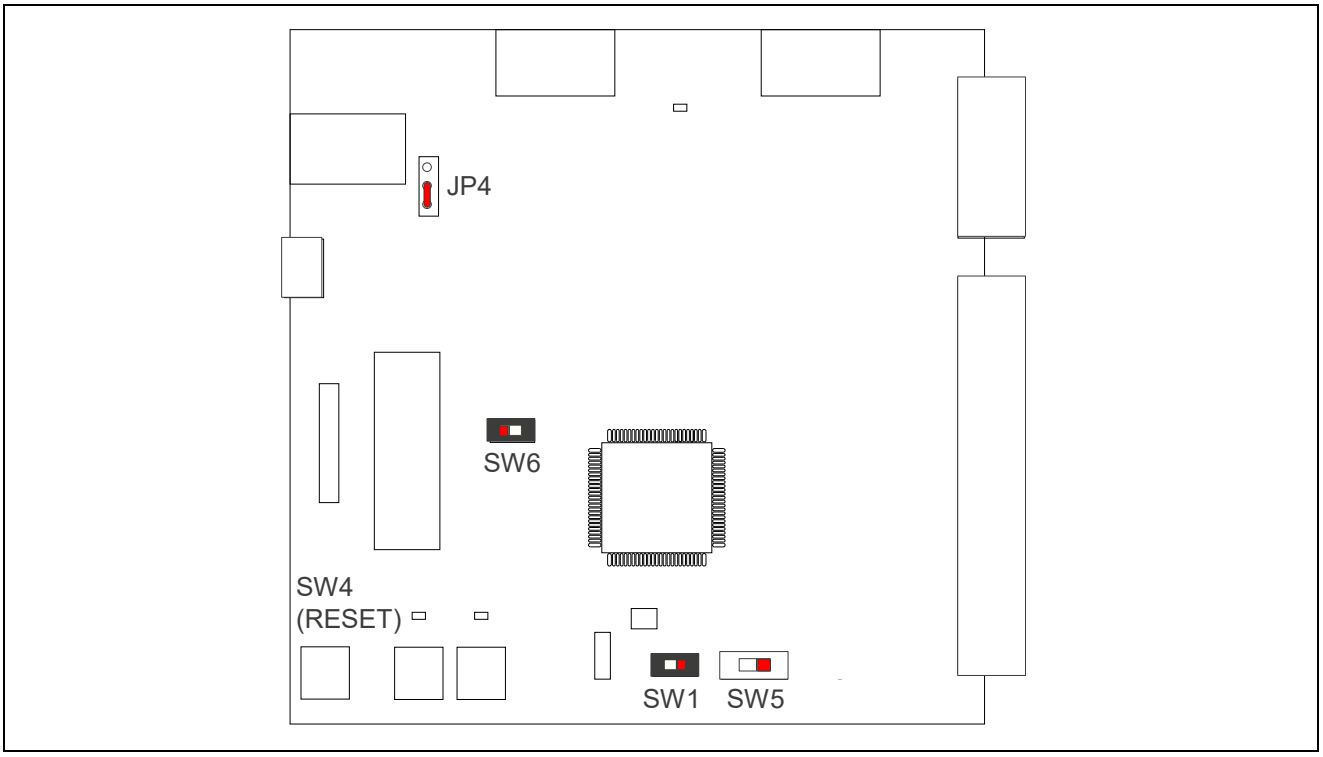


Figure 2-4. Default Jumper Positions

Table 2-1. Default Jumper Settings

Reference	Circuit Group	Default State	Description
JP4	Power supply	Shorted Pin 1-2	Supplies USB power to board USB
SW1	Capacitive touch / Debug interface	OFF	Uses P34/TS0/TRST# as TS pin.
SW5		OFF	Uses P27/TS2/TCK and P26/TS3/TXD1 as TS pins..
SW6	MCU operating mode settings	OFF	MCU operates in Single Chip Mode
R101	Pmod (PMOD1)	Short	Uses CN3 as Pmod Type 2A or Type 3A
R102		Short	
R103		Open	
R104		Open	

2.3.2 MCU Operating Mode Settings

Table 2-2 provides the RX671 operating mode settings.

Table 2-2. RX671 Operating Mode Settings

Reference	Position	Default Setting (X)	MCU Operating Mode
SW6	OFF (pins 2-3)	X	Single Chip Mode
	ON (pins 1-2)		SCI Boot Mode

Table 2-3 lists the switch specifications for capacitive touch and debug interface settings..

Table 2-3. Switch Specifications for Capacitive Touch and Debug Interface Settings

Reference	Position	Default Setting (X)	Description
SW1	OFF (2-3 pin)	X	Uses P34/TS0/TRST# as TS pin. (Note1)
	ON (1-2 pin)		Uses P34/TS0/TRST# as debug pin. (Note2)
SW5	OFF (1-2, 4-5 pin)	X	Uses P27/TS2/TCK and P26/TS3/TXD1 as TS pins. (Note1)
	ON (2-3, 5-6 pin)		Uses P27/TS2/TCK and P26/TS3/TXD1 as debug pins. (Note2)
Note1: FINE connection is available for the debugger. JTAG connection is not available. Note2: FINE or JTAG connection is available for the debugger. Cannot be used as TS pins.			

Figure 2-5 shows the RX671 operating mode setting circuit. Use these settings.

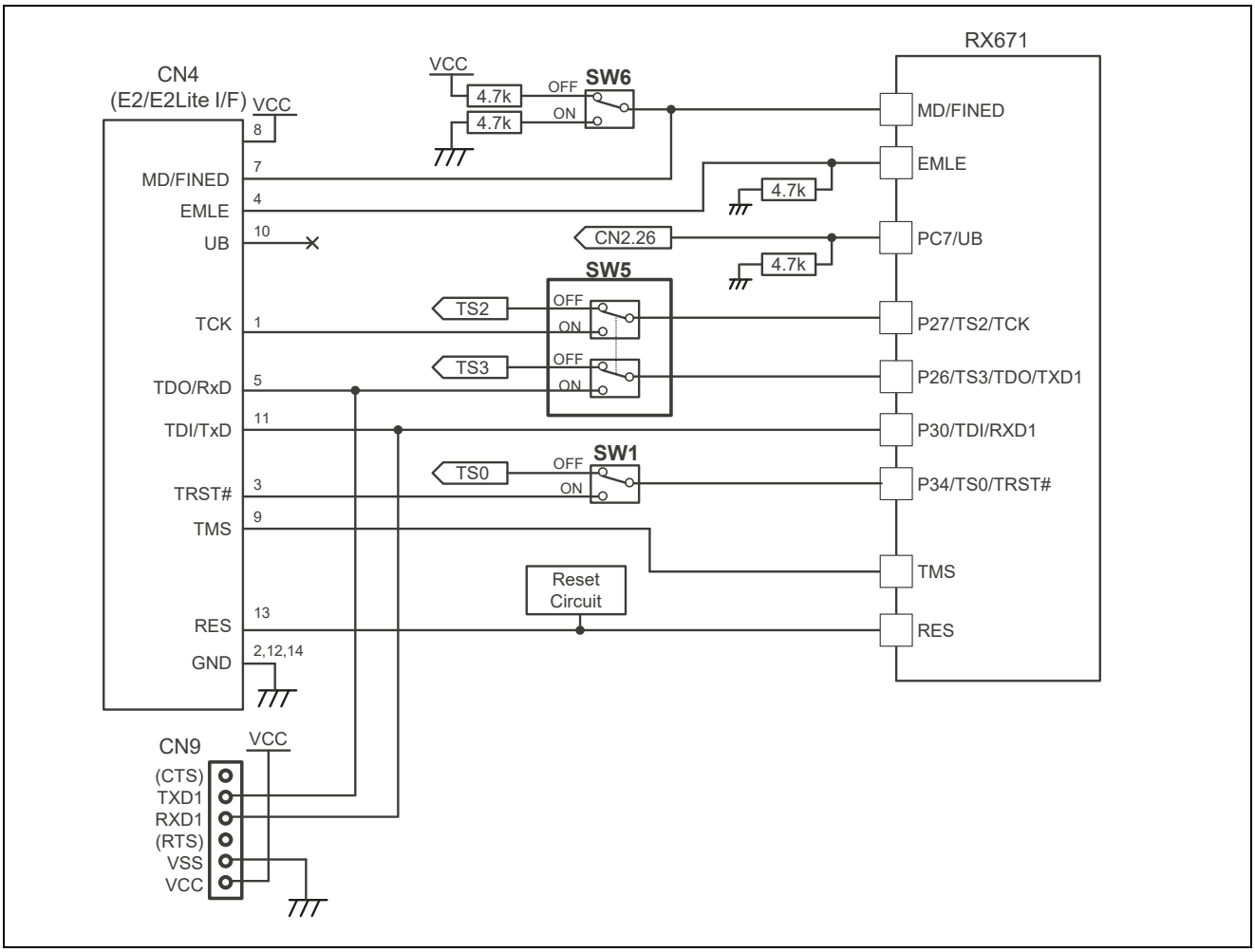


Figure 2-5. RX671 Operating Mode Setting CircuitPower Supply

2.3.3 Power Supply

Table 2-4 provides the power supply jumper settings. This CPU board can be supplied with 5V power by USB or a 2.1mm center positive DC barrel jack connector. The device on this CPU board is designed to run at 3.3V. The total current available from the onboard 3.3V Low Dropout Regulator (LDO) is 400 mA. Any power supply can be connected to J1 to provide more current to the board power supply. Open JP5/PAD3 when using J1.

Table 2-4. Power Source Jumper Settings

Reference	Jumper Setting	Default Setting (X)	Description
JP4	Shorted Pins 1-2	X	Supplies USB power source to LDO.
	Shorted Pins 2-3		Supplies DC jack (CN5) to LDO
JP5 / PAD3	Shorted Pins 1-2	X	Supplies LDO power source to board power source
	Open		Disconnect LDO and board power source
JP3 / PAD1	Shorted Pins 1-2	X	Supplies board power source to MCU
	Open		MCU current consumption measurement setting

Figure 2-6 shows the power source system diagram. Figure 2-7 shows the J1 pin assignments

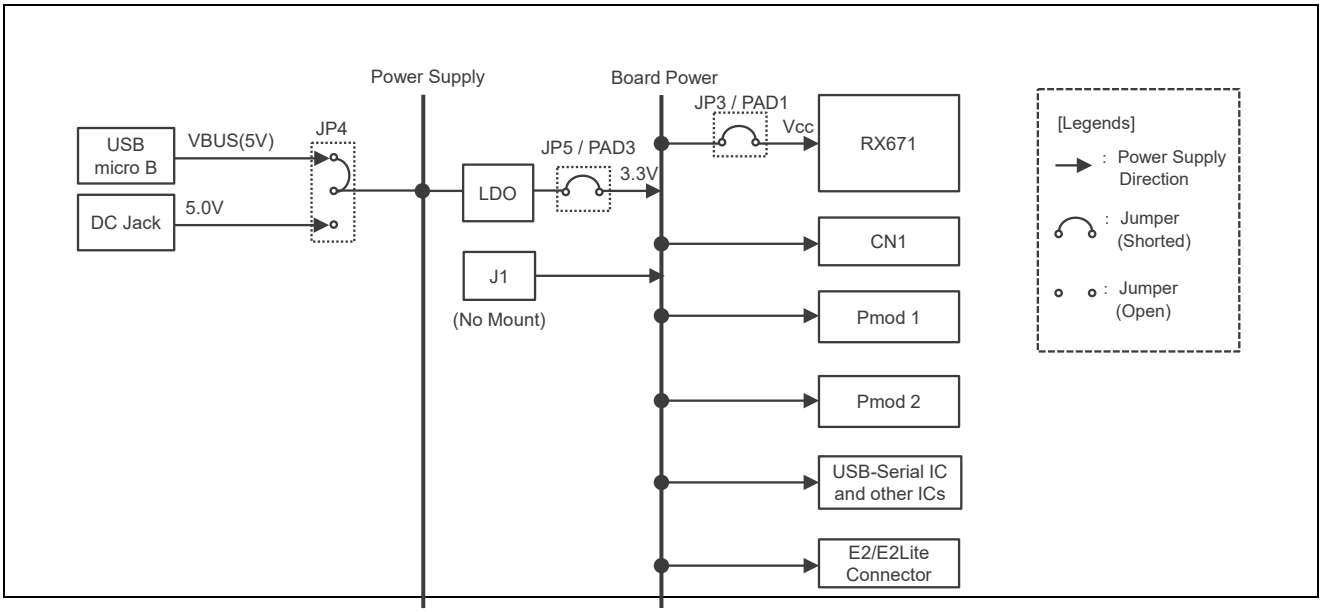
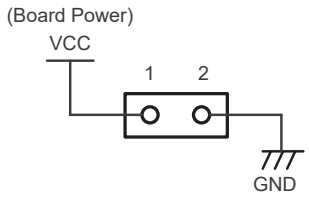


Figure 2-6. Power Source System Diagram



Pin	Connection
1	VCC（ Board Power）
2	GND

Figure 2-7. J1 Pin Assignments

2.3.4 Clock Circuit

Table 2-5 lists the clock specifications of the CPU board. Figure 2-8 shows the clock circuit.

Table 2-5. Clock Specifications

Clock	Function	Default State	Frequency	Package
X1	Main clock (crystal resonator)	Not mounted	12MHz	3.2mm x 2.5mm SMD
X2	Sub clock	Not mounted	32.768kHz	1.88mm x 6.00mm Cylinder type, wire lead product

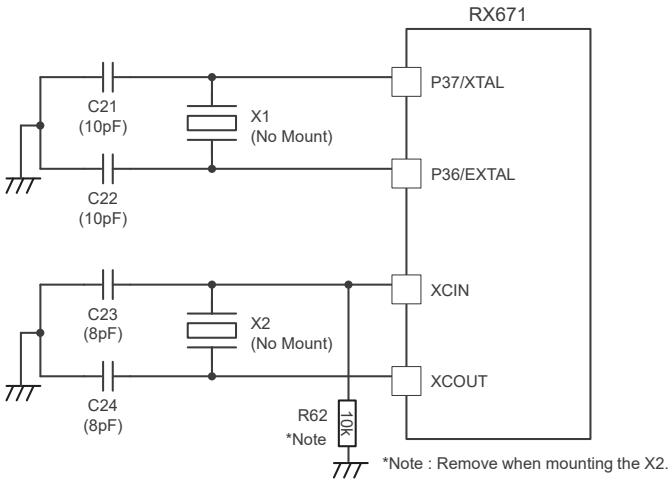


Figure 2-8. Clock Circuit

2.3.5 Reset Circuit

The RX671 CPU Board is equipped with a reset switch (SW4) which generates a reset signal to restart the main MCU.

2.3.6 Push Switch

Table 2-6. lists the push switch specifications. Figure 2-9 shows the push switch circuit.

Table 2-6. Push Switch Specifications

Reference	MCU Control Port	Function
SW4（Reset）	RES#	Resets the MCU.
SW2	PJ3 / IRQ11	User controllable switch.
SW3	P32 / IRQ2-DS	User controllable switch.

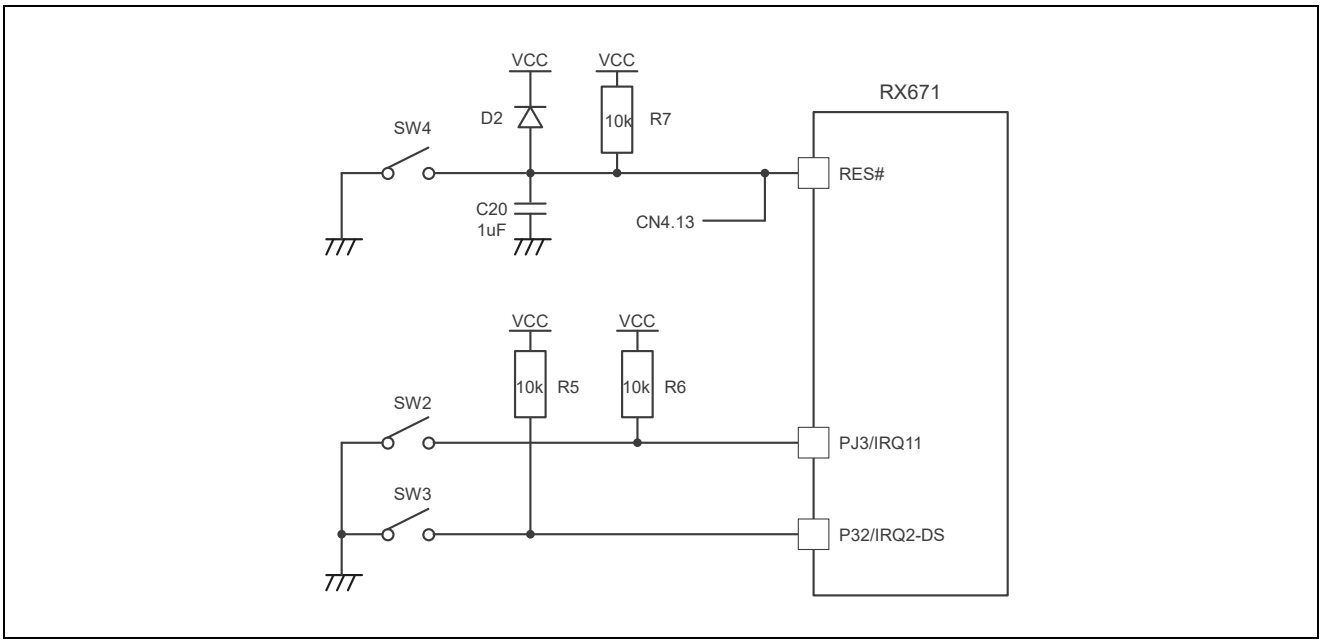


Figure 2-9. Push Switch Circuit

2.3.7 LEDs

Table 2-7 provides the connection port and function of each LED. Figure 2-10 shows the LED circuit.

Table 2-7. LED Functions and Connections

LED	MCU Control Port	Function	Color
LED1 (Power)	VCC	Power status display	Red
LED2	P07	User LED	Green
LED3	P05	User LED	Yellow

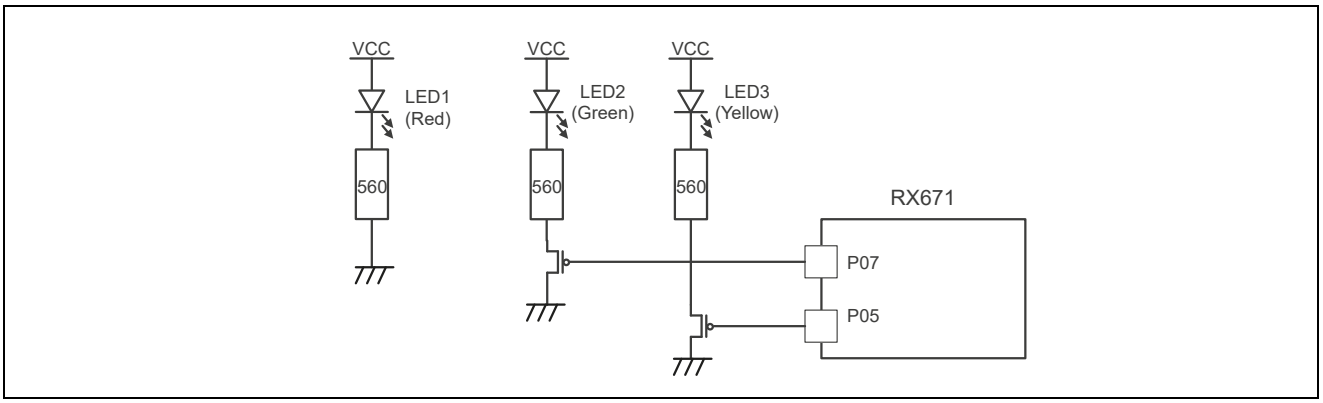


Figure 2-10. LED Circuit

2.3.8 USB Serial Conversion

Table 2-8 lists connections for USB serial IC and MCU controller. The RX671 Cap Touch Evaluation System Board is equipped with USB serial IC FT234XD (FTDI Ltd.) for USB serial conversion. The FT234XD is connected to the RX671's serial communication interface (SCI) module.

Table 2-8 USB Serial Conversion

Signal Name	MCU Control Port	Function
TXD	PE1 / TXD12	SCI12 transmit data signal
RXD	PE2 / RXD12	SCI12 receive data signal

2.3.9 Debug Interface

The CPU board is equipped with an E2/E2 Lite connector (14-pin box connector) for use as debugging interface. For details, refer to Reference Materials [2].

2.3.10 Application Header

The two application headers, CN1 and CN2, can be used as interface for the user's own board.

CN1 is used for GPIO pins. For more details regarding peripheral functions not listed here, refer to the User's Manual Hardware Version.

CN2 is mainly used for CTSU pins. Fix the GPIO pins to low by software. Do not connect anything to TSCAP.

Table 2-9. Application Header (CN1)

CN1	MCU		CN1	MCU	
Pin	Port	Peripheral	Pin	Port	Peripheral
16	VSS（GND）		15	VCC	
14	P47	AN007	13	P46	
12	P45		11	P44	
10	PA0		9	PA5	
8	PA6		7	PA7	
6	PE0		5	PE3	
4	PE4		3	PE7	MISOB-B
2	PE5	RSPCKB-B	1	PE6	MOSIB-B

Table 2-10. Application Header (CN2)

CN2	MCU		CN2	MCU	
Pin	Port	CTSU	Pin	Port	CTSU
40	PC4	TSCAP	39	—	—
38	—	—	37	—	—
36	PC0	TS16	35	PB5	—
34	PC1	TS15	33	PB6	—
32	PB7	—	31	PC5	TS14
30	PC3	—	29	PC2	—
28	PC6	TS13	27	P50	—
26	PC7/UB (Note)	—	25	P51	—
24	P52	—	23	P54	—
22	P53	TS12	21	P14	TS11
20	P55	—	19	PH1	—
18	PH2	—	17	P12	—
16	P15	TS10	15	P13	—
14	P16	—	13	P31/TMS	—
12	P30/TDI/RXD1	—	11	P17	—
10	P20	TS9	9	P21	TS8
8	P22	TS7	7	P23	TS6
6	P24	TS5	5	P25	TS4
4	P33	TS1	3	P26/TDO/TXD1	TS3
2	P34/TRST#	TS0	1	P27/TCK	TS2

— : Not Applicable

2.3.11 CTSU Related Circuits

2.3.11.1 CTSU correction circuit

This circuit improves the absolute accuracy of the CTSU's capacitive measurement. The resistor and control software required for the correction function are sold separately. When not using the correction control software, no resistor is necessary.

Table 2-11. CTSU Correction Circuit Settings

Reference	MCU Control Port	Default Setting	Spec	Package
R10	P43	Not mounted	100K Ohm	1.6mm x 0.8mm SMD
R11	P42	Not mounted	68K Ohm	
R12	P41	Not mounted	51K Ohm	
R13	P40 / AN000	Not mounted	0 Ohm	

2.3.12 Pmod Interface

Table 2-12 lists connections PMOD1 pin assignments. Header PMOD1 is the interface for Pmod Type 2A and Type 3A. PMOD1 can also be used for Pmod Type 6A by using the Pmod interface switch circuit. When connecting the Pmod module, check the pin position and be careful not to misalign the pin position or stick it backwards.

Table 2-12. PMOD1 Pin Assignments

Pin	Type 2A/3A Function	MCU Port	Pin	Type 6A Function	MCU Port
1	CS/CTS	PB2/CTS6#/SS6#	1	NC	PB2/CTS6#/SS6#
2	MOSI/TXD	PB1/SMOSI6/TXD6/SSDA6 **(Note)**	2	NC	PB3/SCK6 **(Note)**
3	MISO/RXD	PB0/SMISO6/RXD6/SSCL6	3	SCL	PB0/SMISO6/RXD6/SSCL6
4	SCK/RTS	PB3/SCK6 **(Note)**	4	SDA	PB1/SMOSI6/TXD6/SSDA6 **(Note)**
5	GND	VSS(GND)	5	GND	VSS(GND)
6	VCC	VCC	6	VCC	VCC
7	GPIO	PA2	7	GPIO	PA2
8	GPIO	PA4/TXD5	8	GPIO	PA4/TXD5
9	GPIO	PA3/RXD5	9	GPIO	PA3/RXD5
10	GPIO	PA1/SCK5	10	GPIO	PA1/SCK5
11	GND	VSS(GND)	11	GND	VSS(GND)
12	VCC	VCC	12	VCC	VCC

Note: Replace resistors of R101, R102, R103, and R104.

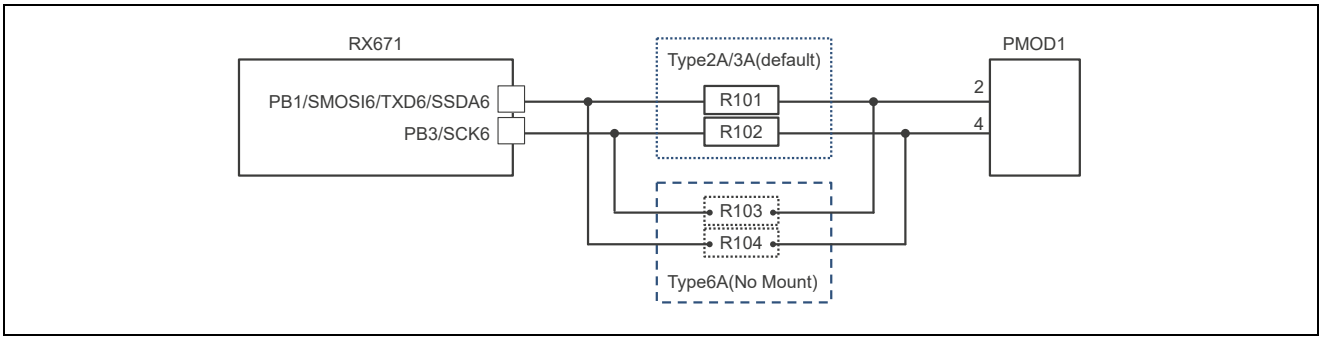


Figure 2-11. PMOD1 Interface Switch Circuit

Table 2-13 lists connections PMOD2 pin assignments.

Table 2-13. PMOD2 Pin Assignments

Pin	Type2A Function	MCU Port
1	CS	PD4/SSLC0-A
2	MOSI	PD1/MOSIC-A
3	MISO	PD2/MISOC-A
4	SCK	PD3/RSPCKC-A
5	GND	VSS(GND)
6	VCC	VDD
7	GPIO	PD0/IRQ0
8	GPIO	PD5/SSLC1-A
9	GPIO	PD6/SSLC2-A
10	GPIO	PD7/SSLC3-A
11	GND	VSS(GND)
12	VCC	VCC

3. Application Board (Self-Capacitance Electrode Board)

3.1 Board Layout

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

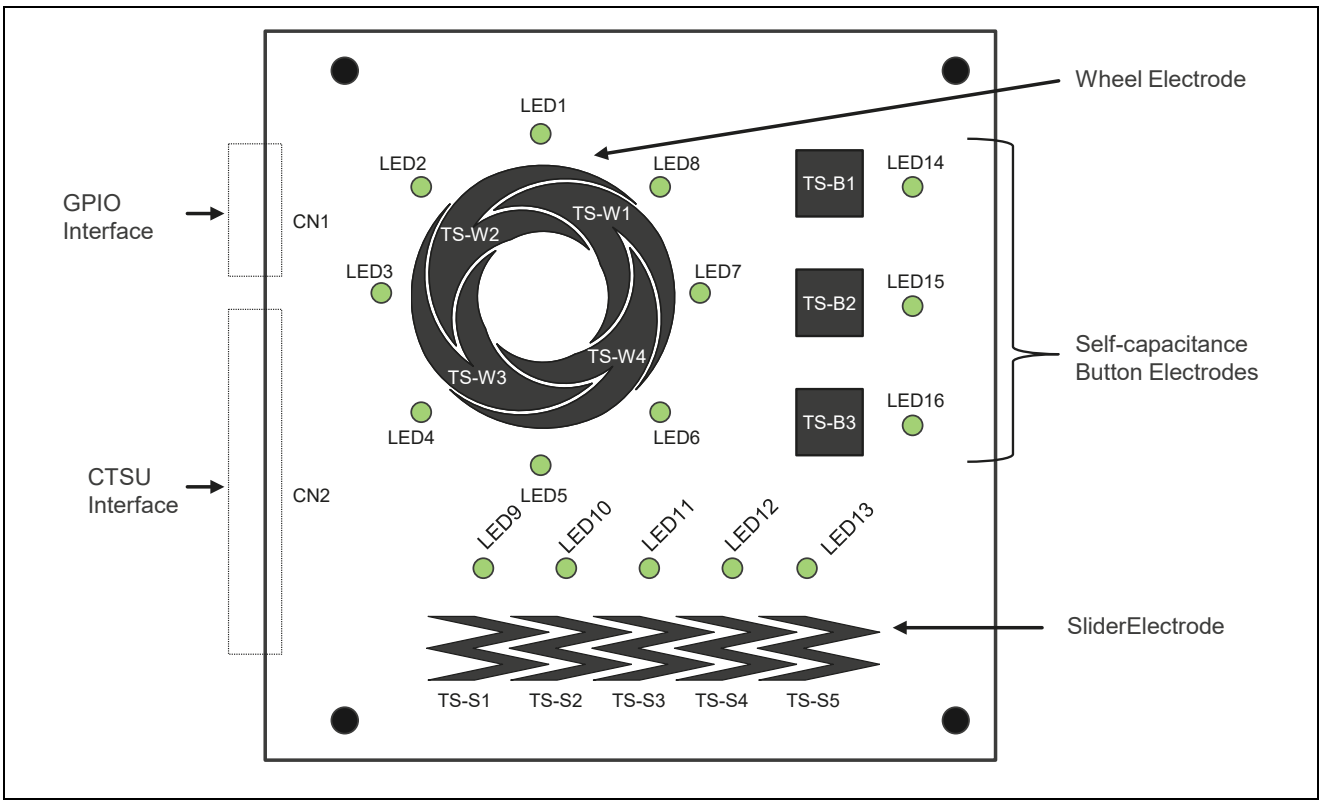


Figure 3-1. Board Layout and TS Pin Assignments

3.2 Application Headers

Application headers CN1 and CN2 are the interface for connection to the Renesas Capacitive Touch Evaluation System CPU board. Table 2-9 lists the pin assignments for CN1. Table 2-10 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	P46	14	LED_ROW1	P47
11	LED_ROW2	P44	12	LED_ROW3	P45
9	—	—	10	—	—
7	LED_COL3	PA7	8	—	—
5	LED_COL1	PE3	6	LED_COL2	PE0
3	—	—	4	LED_COL0	PE4
1	—	—	2	—	—

— : Not Applicable

Table 3-2. Application Header (CN2)

Pin	Touch Electrode	CTSU (RX671) (Note1)	Pin	Touch Electrode	CTSU (RX671) (Note1)
39	—	—	40	—	TSCAP
37	—	—	38	—	—
35	—	—	36	TS-W1	TS16
33	—	—	34	TS-W2	TS15
31	TS-W3	TS14	32	—	—
29	—	—	30	—	—
27	—	—	28	TS-W4	TS13
25	—	—	26	—	—
23	—	—	24	—	—
21	—	—	22	SHIELD-W1	P53 (Note2)
19	—	—	20	—	—
17	—	—	18	—	—
15	—	—	16	—	
13	—	—	14	—	—
11	—	—	12	—	—
9	TS-B1	TS8	10	TS-B2	TS9
7	SHIELD-B1	P23 (Note2)	8	TS-B3	TS7
5	TS-S1	TS4	6	SHIELD-S1	P24 (Note2)
3	TS-S3	TS3	4	TS-S2	TS1
1	TS-S5	TS2	2	TS-S4	TS0

— : 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 the function, set the pin to low by software.

4. Reference Materials

[1]. Renesas RX671 Group User's Manual: Hardware (01UH0899)

[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 RX671 Group User's Manual Hardware Version for more information on RX671 Group MCUs.

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

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Appendix: Self-Capacitance Touch Electrode Board Connection

The following describes how to use the Renesas Self-Capacitance Touch Electrode Board (RTK0EG0019B01002BJ).

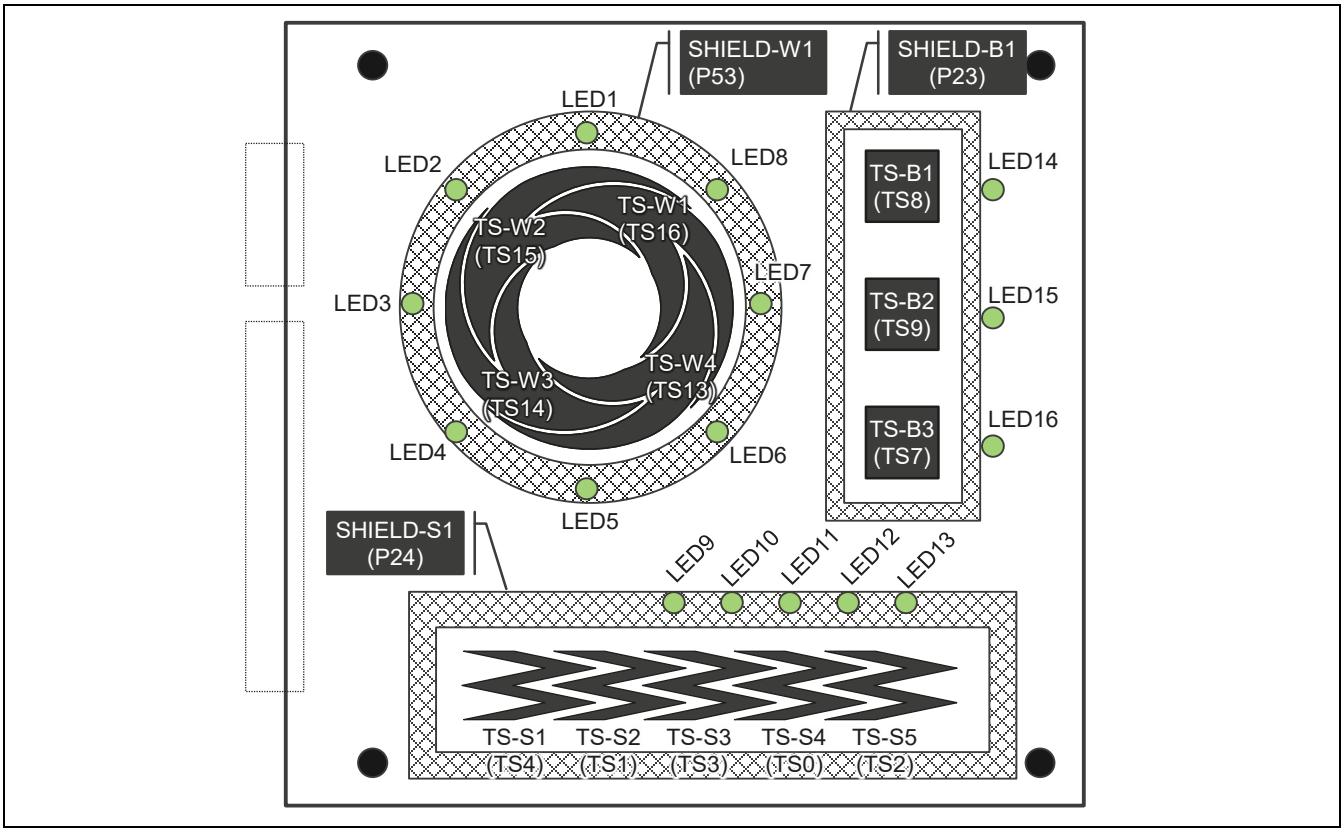

Figure 2. Board Layout and TS Pin Assignments

Table 1. TS Pin (CN2) Assignments

Touch Electrode	CTSU (RX671)	Description
TS-W1	TS16	Wheel Electrode
TS-W2	TS15	
TS-W3	TS14	
TS-W4	TS13	
SHIELD-W1	P53 (Note)	Wheel Shield Electrode
TS-B1	TS8	Button Electrode
TS-B2	TS9	
TS-B3	TS7	
SHIELD-B1	P23 (Note)	Button Shield Electrode
TS-S1	TS4	Slider Electrode
TS-S2	TS1	
TS-S3	TS3	
TS-S4	TS0	
TS-S5	TS2	
SHIELD-S1	P24 (Note)	Slider Shield Electrode

Note: Set the pin to low by software.

Table 2. TS Pin (CN2) Assignments

Signal	RX671 Port	Description
LED_ROW0	P46	LED Matrix, High Side Transistor Drive
LED_ROW1	P47	
LED_ROW2	P44	
LED_ROW3	P45	
LED_COL0	PE4	LED Matrix, Low Side Transistor Drive
LED_COL1	PE3	
LED_COL2	PE0	
LED_COL3	PA7	
LED_VCC	VCC	VCC
LED_GND	GND	GND

Table 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 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

Revision History	RX671 Group Capacitive Touch Evaluation System User's Manual

Rev.	Date	Description	
		Page	Summary
1.00	Sep.30.22	—	First Edition issued
1.10	Apr.26.24	—	Additions and changes due to updated EMC standard.
		3	・How to Use This Manual Added description of electromagnetic environment ・1.4 Regulatory Compliance Notices Added description of conformity standard.

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Capacitive Touch Evaluation System
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