

RX671 Group

Evaluation Kit for RX671 Microcontroller Group
EK-RX671 v1
User's Manual

Renesas RX Family
RX600 Series

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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.

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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.

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Renesas RX Family

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1. Kit Overview

The EK-RX671, an Evaluation Kit for RX671 MCU Group, enables users to seamlessly evaluate the features of the RX671 MCU group and develop embedded systems applications using Firmware Integration Technology (FIT) and e² studio IDE. The users can utilize rich on-board features along with their choice of popular ecosystems add-ons to bring their big ideas to life.

The key features of the EK-RX671 board are categorized in three groups (consistent with the architecture of the kit) as follows:

MCU Native Pin Access

- R5F5671EHDFB*¹ MCU (referred to as RX MCU)
- 120 MHz, 32-bit RX CPU (RXv3)
- 2 MB ROM, 384 kB RAM
- 144 pins, LFQFP package
- Native pin access through 6 x 2-pin, 18 x 2-pin and 11 x 2-pin male headers
- MCU current measurement points for current consumption measurement
- Multiple clock sources - Providing 24.000 MHz and 32.768 kHz reference clock. Additional low-precision clocks are available internal to the RX MCU
- DIP switch to select RX MCU operating mode configuration, and signals from/to microSD card, external SDRAM and QSPI flash memory

Special Feature Access

- microSD card slot*^{2,3}
- Audio interface
- 128 Mbit external SDRAM (16-bit data width) *^{3,4}
- 64 Mbit external QSPI flash memory*^{3,4}
- Touch interface with 2 touch buttons*⁴

System Control and Ecosystem Access

- Four +5 V input sources
 - USB (USB DEBUG1, USB FULL SPEED, USB SERIAL)
 - External power supply (using surface mount clamp test points and power input vias)
- Two Debug modes
 - Debug on-board (E2 emulator On Board (referred to as E2 OB): FINE interface)
 - Debug in (JTAG or FINE interface)
- User LEDs and switches
 - Three User LEDs (red, blue, green)
 - Power LED (white) indicating availability of regulated power
 - Debug LED (yellow) indicating the debug connection
 - Two User switches
 - One Reset switch
- Five most popular ecosystems expansions
 - 2 Seeed Grove[®] system (I2C / Analog) connectors
 - SparkFun[®] Qwiic[®] connector
 - 2 Digilent Pmod[™] (UART / SPI / I2C) connectors
 - Arduino[®] (Uno R3) connector
 - MikroElektronika mikroBUS[™] connector
- USB serial converter interface
- RX671 USB Full speed host and function

*1: R5F5671EHDFB has a built in security function.

*2: The RX671 Group incorporate an SD Host Interface (SDHI) which is compliant with the SD Specifications. When developing host devices that are compliant with the SD Specifications, the user must enter into the SD Host/Ancillary Product License Agreement (SD HALA).

*3: The microSD card, external SDRAM and QSPI flash memory on the EK-RX671 board cannot be used simultaneously because RX MCU pins of these functions are multiplexed. One out of 3 functions (microSD card, external SDRAM and QSPI flash memory) can be used.

*4: QSPI flash memory, external SDRAM and 2 touch buttons connected to touch interface are not implemented on Special Feature Access Area, however, these functions are functionally categorized into Special Feature Access.

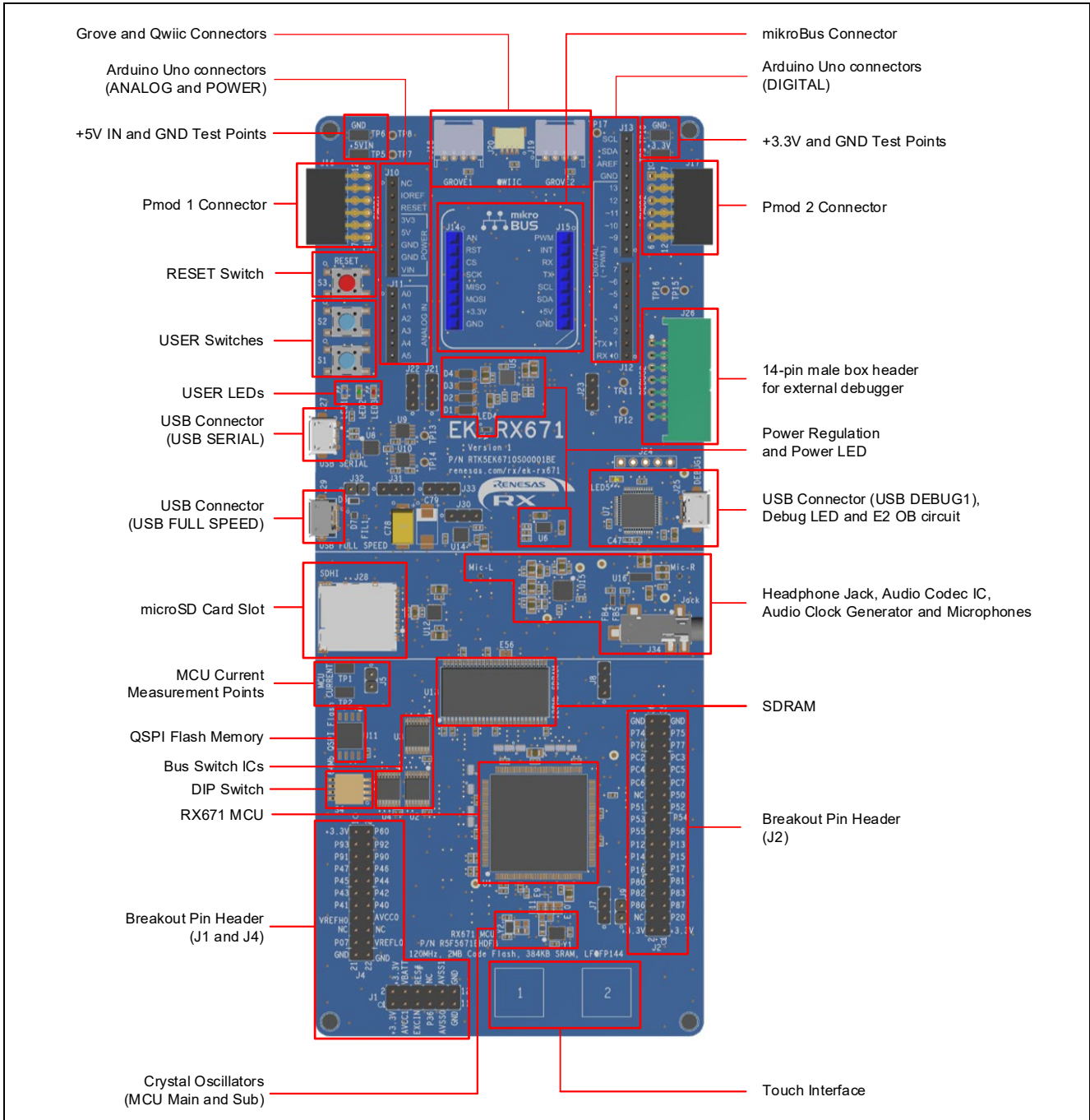


Figure 1-1. EK-RX671 Board Top Side

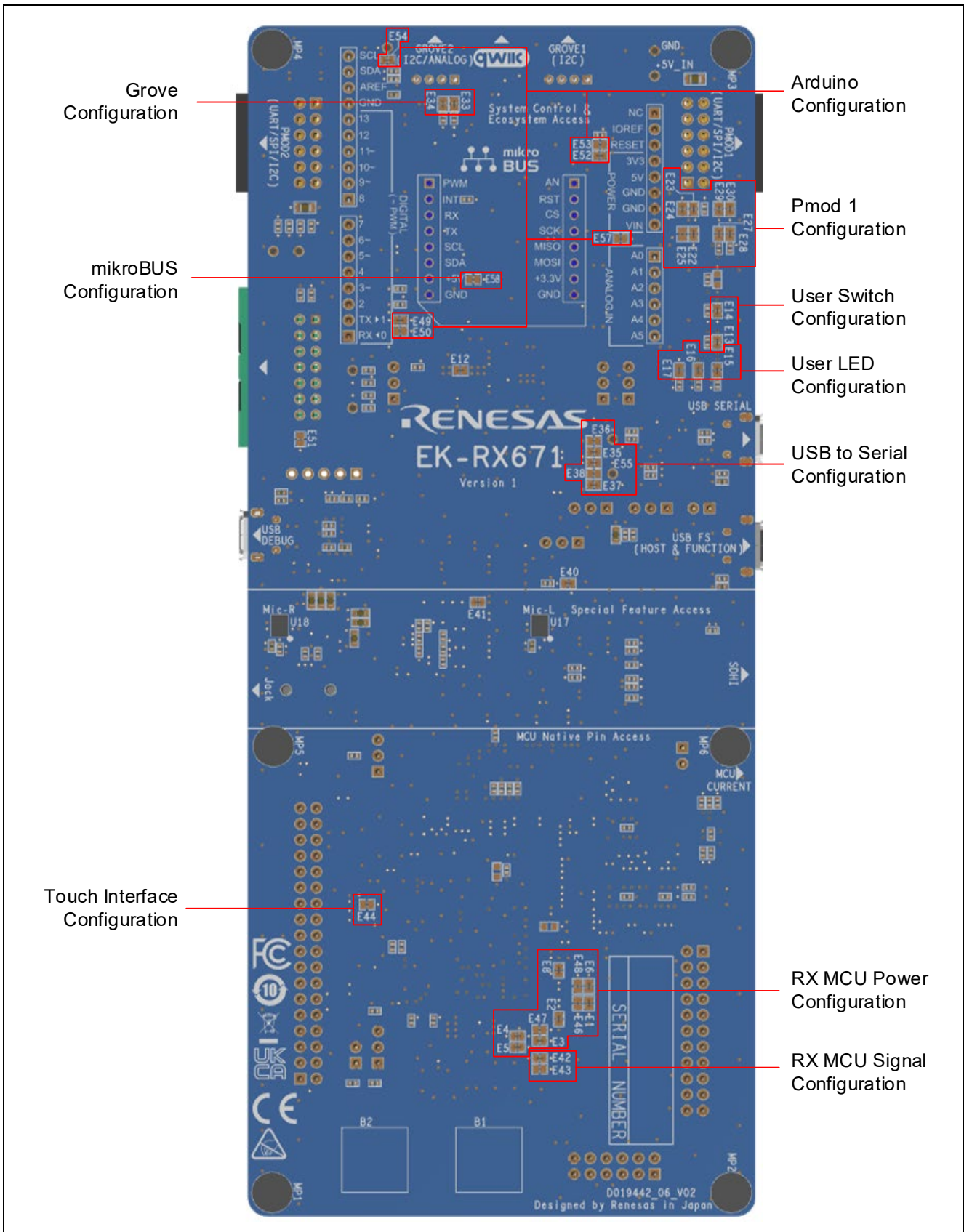


Figure 1-2. EK-RX671 Board Bottom Side

1.1 Assumptions and Advisory Notes

1. It is assumed that the user has basic understanding of microcontrollers and embedded systems hardware.
2. It is recommended that the user refers to the *EK-RX671 Quick Start Guide* to get acquainted with the kit and the Quick Start example project that EK-RX671 board comes pre-programmed with.
3. Firmware Integration Technology (FIT) and Integrated Development Environment (IDE) such as e² studio are required to develop embedded applications on EK-RX671 kit.
4. Instructions to download and install software, import example projects, build them and program the EK-RX671 board are provided in the quick start guide.
5. The MCU fitted to the EK-RX671 board may not contain the latest version of the on-chip boot firmware.

2. Kit Contents

The following components are included in the kit:

1. EK-RX671 v1 board x 1
2. Micro USB function cable (type-A male to micro-B male) x 1
3. Micro USB host cable (type-A female to micro-B male) x 1

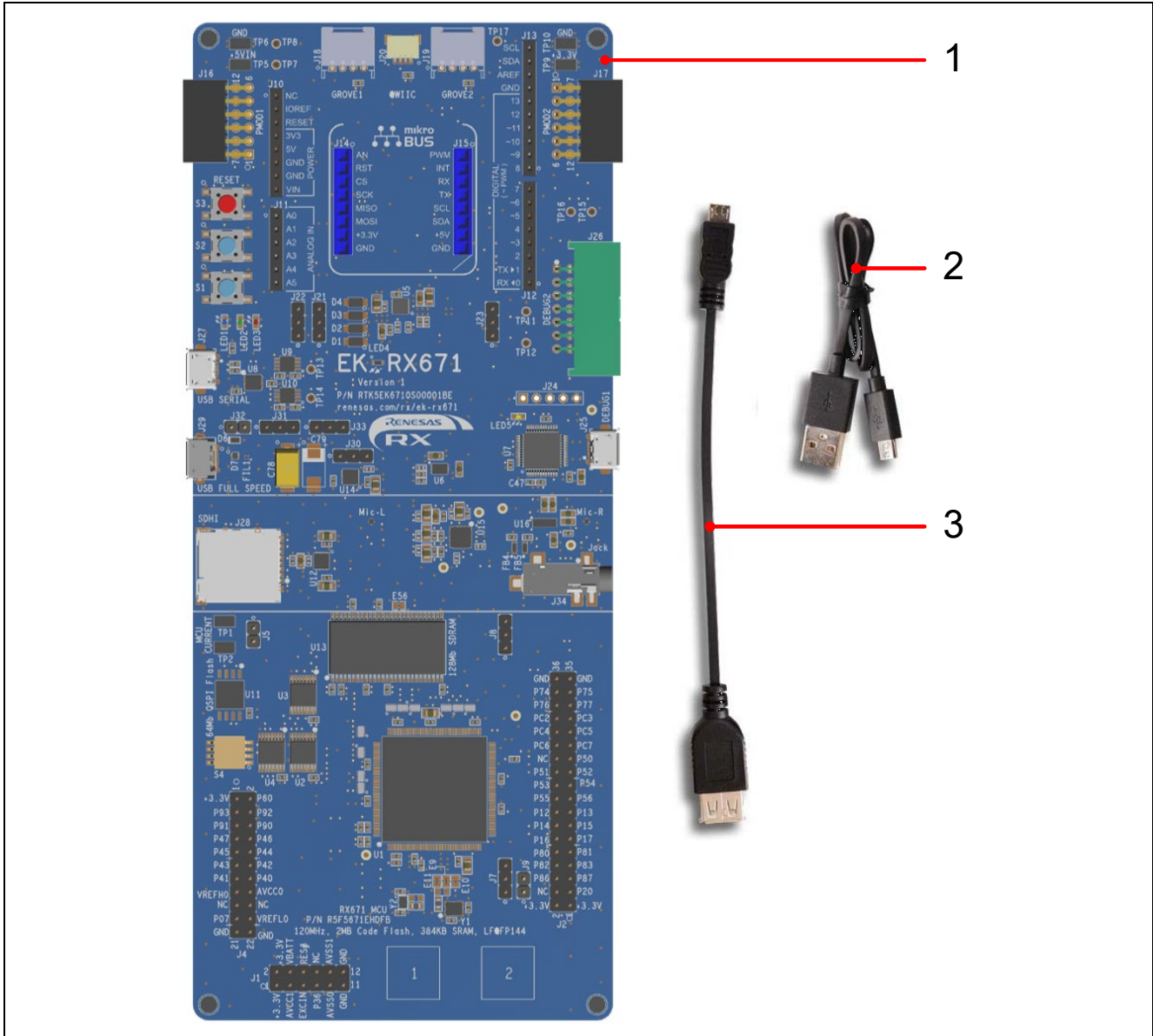


Figure 2-1. EK-RX671 Kit Contents

3. Ordering Information

- EK-RX671 v1 kit orderable part number: RTK5EK6710S00001BE

Note: The underlined character in the orderable part number represents the kit version.

- EK-RX671 board dimensions: 80 mm (width) x 190 mm (length)

4. Hardware Architecture and Default Configuration

4.1 Kit Architecture

The EK-RX671 board is designed with three areas to help shorten the learning curve of the users and maximize the design and knowledge reuse among similar kits. The contents of these three areas are conceptually standardized among similar kits.

Table 4-1. Kit Architecture

Kit area	Area features	Area present on all similar kits	Functionality is:
MCU Native Pin Access Area	RX MCU, breakout pin headers for MCU I/O and power, current measurement	Yes	MCU dependent
Special Feature Access Area ^{*1}	MCU special features: Audio, SDHI, SDRAM controller, QSPIX, Touch interface	Optional	MCU dependent
System Control and Ecosystem Access Area	Power, E2 OB circuit, User LEDs and switches, reset switch, ecosystem connectors, USB Full Speed Host and Function, USB serial converter interface	Yes	Same or similar across similar kits

*1: QSPI flash memory, external SDRAM and 2 touch buttons connected to touch interface are not implemented on Special Feature Access Area, however, these functions are functionally categorized into Special Feature Access.

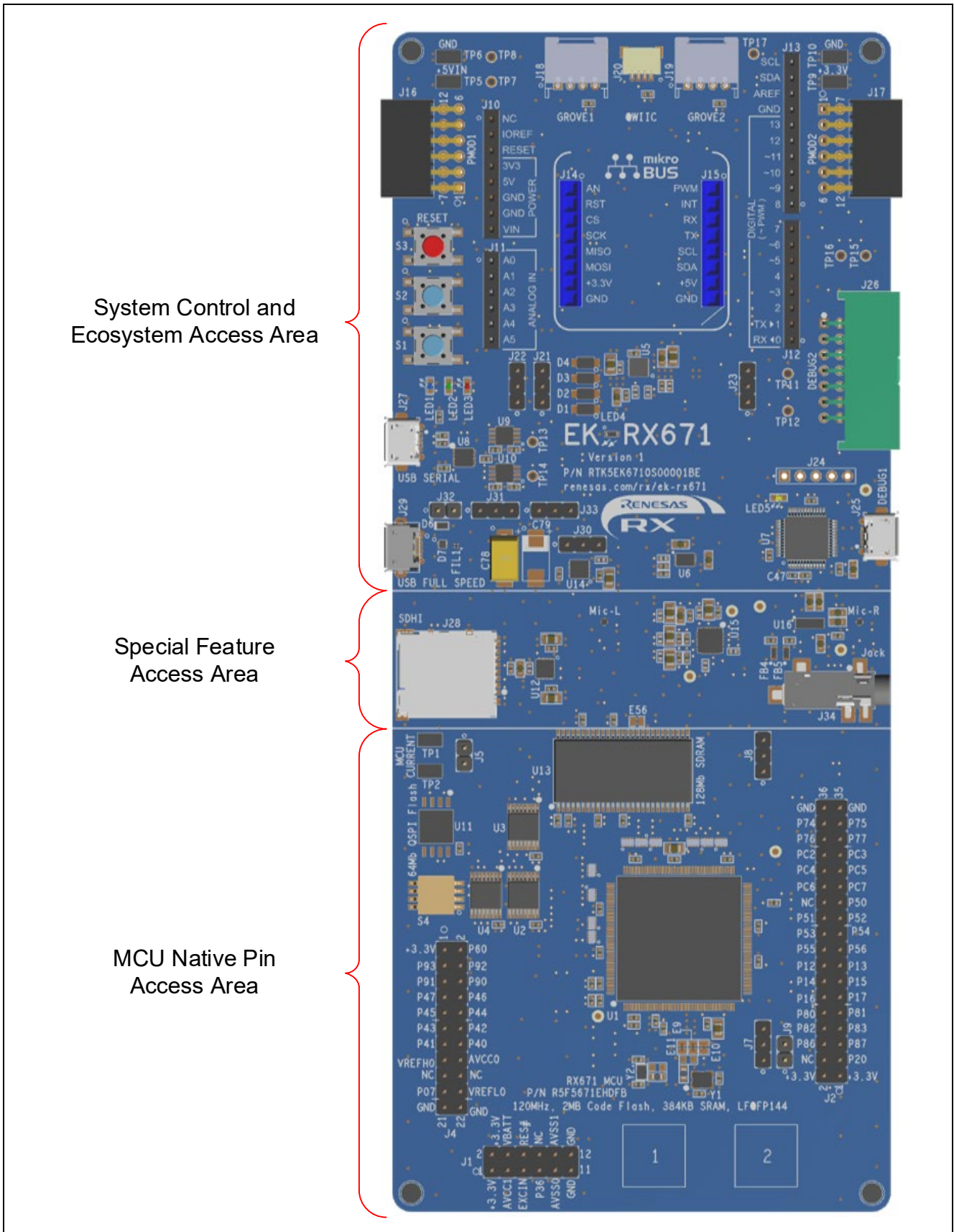


Figure 4-1. EK-RX671 Board Area Definitions

4.2 System Block Diagram

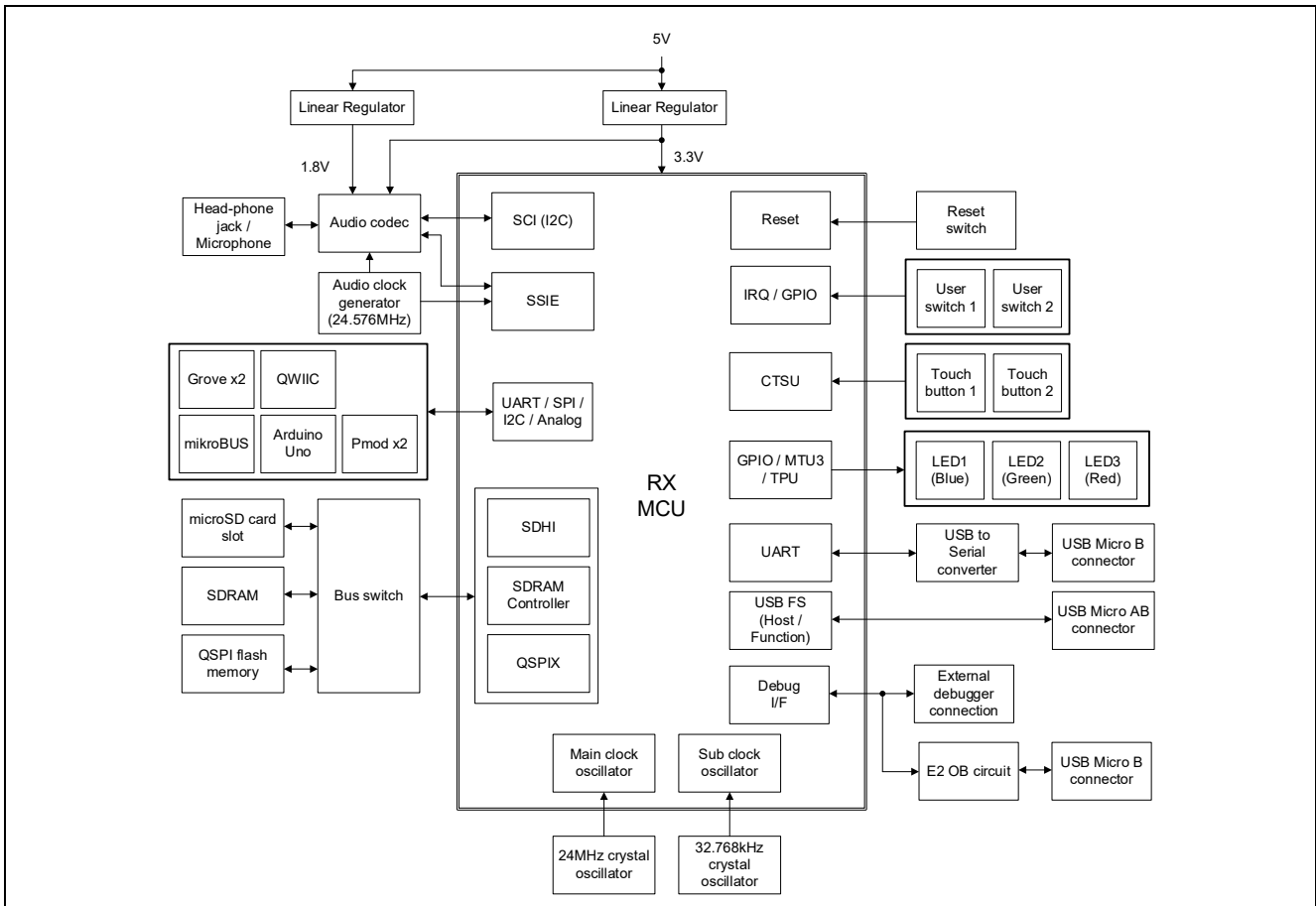


Figure 4-2. EK-RX671 Board Block Diagram

4.3 Jumper Settings

Two types of jumpers are provided on the EK-RX671 board.

1. Copper jumpers (trace-cut type and solder bridge type)
2. Traditional pin header jumpers

The following sections describe each type and their default configuration.

4.3.1 Copper Jumpers

Copper jumpers are of two types, designated **trace-cut** and **solder-bridge**.

A **trace-cut jumper** is provided with a narrow copper trace connecting its pads. To isolate the pads, cut the trace between pads adjacent to each pad, then remove the connecting copper foil either mechanically or with the assistance of heat. Once the etched copper trace is removed, the trace-cut jumper is turned into a solder-bridge jumper for any later changes.

A **solder-bridge** jumper is provided with two isolated pads that may be joined together by one of three methods:

- Solder may be applied to both pads to develop a bulge on each and the bulges joined by touching a soldering iron across the two pads.
- A small wire may be placed across the two pads and soldered in place.
- A SMT resistor may be placed across the two pads and soldered in place. A zero-ohm SMT resistor shorts the pads together.

For any copper jumper, the connection is considered **closed** if there is an electrical connection between the pads (default for trace-cut jumpers.) The connection is considered **open** if there is no electrical connection between the pads (default for the solder-bridge jumpers.)

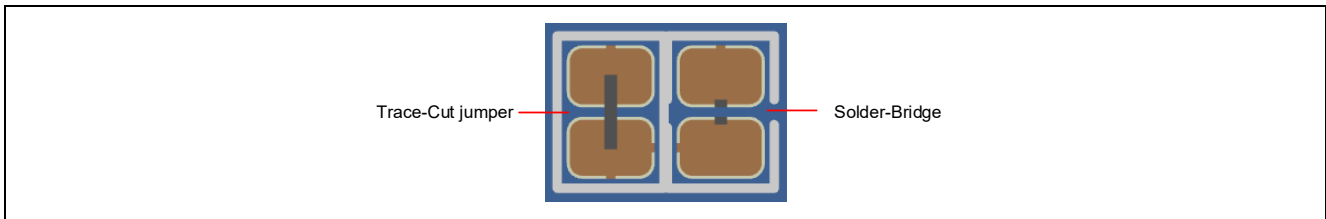


Figure 4-3. Copper Jumpers

4.3.2 Traditional Pin Header Jumpers

The traditional pin jumpers on the EK-RX671 board are 2.54 mm pitch headers. These jumpers are traditional pitch jumpers that require an external shunt to open/close them.

4.3.3 Default Jumper and DIP Switch Configuration

The following table describes the default settings for copper jumpers (Ex designation), traditional pin jumpers (Jx designation) and DIP switch (S4 designation) on the EK-RX671 board.

The Circuit Group for each jumper and DIP switch is the designation found in the board schematic (available in the Design Package).

Table 4-2. Default Jumper Settings

Location	Circuit Group	Default	Function
J5	RX671 MCU	Short	RX MCU Current Measurement
J7	RX671 Signal Select	Jumper on pins 2-3	Set RX MCU to “Single Chip mode or Debug in mode” (Refer to section 5.2.2 regarding to Debug in mode.)
J8	RX671 Signal Select	Jumper on pins 2-3	
J9	RX671 Signal Select	Open	
S4 Pin1	RX671 Signal Select	OFF	
S4 Pin2	RX671 Signal Select	ON	
S4 Pin3	RX671 Signal Select	OFF	Set bus switch to select QSPI flash memory (Refer to section 7.4 regarding to bus switch.)
S4 Pin4	RX671 Signal Select	OFF	
J21	Pmod	Jumper on pins 1-2	Connect P86 to Pmod 1 (RXD010 / SMISO010)
J22	Pmod	Jumper on pins 1-2	Connect P80 to Pmod 1 (RTS010# / SCK010)
J23	Pmod	Jumper on pins 1-2	Connect P75 to Pmod 2 (RTS011# / SCK011)
J30	USB FS	Jumper on pins 1-2	Connect P16 to USB0_VBUS
J31	USB FS	Jumper on pins 2-3	Set USB FS to function mode
J32	USB FS	Short	Set USB FS to function mode
J33	USB FS	Jumper on pins 1-2	Connect USB0_VBUS to +3.3 V (Bus powered)
E1	RX671 MCU	Short	Connect AVCC0 to +3.3 V
E46	RX671 MCU	Open	Connect AVCC0 to +3V3_MCU
E2	RX671 MCU	Short	Connect AVSS0 to GND
E3	RX671 MCU	Short	Connect AVCC1 to +3.3 V
E47	RX671 MCU	Open	Connect AVCC1 to +3V3_MCU
E4	RX671 MCU	Short	Connect AVSS1 to GND
E5	RX671 MCU	Short	Connect VBATT to +3.3 V
E6	RX671 MCU	Short	Connect VREFH0 to +3.3 V
E48	RX671 MCU	Open	Connect VREFH0 to +3V3_MCU
E8	RX671 MCU	Short	Connect VREFL0 to GND
E9	RX671 MCU	Short	Connect EXTAL to crystal oscillator
E10	RX671 MCU	Open	Connect EXTAL to breakout pin header J1

Location	Circuit Group	Default	Function
E11	RX671 MCU	Short	Connect XTAL to crystal oscillator
E42	RX671 MCU	Short	Connect PJ3 to USB to Serial (CTS)
E43	RX671 MCU	Open	Connect PJ3 to breakout pin header J1
E44	RX671 MCU	Open	Connect PC4 to breakout pin header J2
E13	User LEDs & Switches	Short	Connect PC3 to user switch S1
E14	User LEDs & Switches	Short	Connect PC5 to user switch S2
E15	User LEDs & Switches	Short	Connect P56 to user LED1
E16	User LEDs & Switches	Short	Connect P82 to user LED2
E17	User LEDs & Switches	Short	Connect P25 to user LED3
E54	Arduino Uno, Pmod, Grove and QWIIC	Short	Connect P12 and P13 to +3.3 V (Pull-up)
E49	Arduino Uno	Short	Connect PC7 to Arduino Uno (D1 / TX)
E50	Arduino Uno	Open	Connect P71 to Arduino Uno (D1)
E52	Arduino Uno	Short	Connect RES# to Arduino Uno (RESET)
E53	Arduino Uno	Open	Connect P02 to Arduino Uno (RESET)
E57	Arduino Uno	Open	Connect +5 V to Arduino Uno (+5 V)
E22	Pmod	Short	Connect P83 to Pmod 1 (CTS / CS / INT)
E23	Pmod	Short	Connect P82 to Pmod 1 (TXD / MOSI)
E24	Pmod	Short	Connect +3.3 V to Pmod 1
E25	Pmod	Open	Connect +5 V to Pmod 1
E27	Pmod	Short	Connect P32 to Pmod 1 (INT)
E28	Pmod	Short	Connect P47 to Pmod 1 (RESET)
E29	Pmod	Short	Connect P15 to Pmod 1 (GPIO)
E30	Pmod	Short	Connect P72 to Pmod 1 (GPIO)
E33	Grove	Short	Connect P01 to +3.3 V (Pull-up)
E34	Grove	Short	Connect P00 to +3.3 V (Pull-up)
E58	mikroBUS	Open	Connect +5 V to mikroBUS (+5 V)
E35	USB to Serial	Short	Connect P00 to USB to Serial (RXD)
E36	USB to Serial	Open	Connect P26 to USB to Serial (RXD)
E37	USB to Serial	Short	Connect P01 to USB to Serial (TXD)
E38	USB to Serial	Open	Connect P30 to USB to Serial (TXD)
E55	USB to Serial	Short	Connect PF5 to USB to Serial (RTS)
E56	USB to Serial	Open	Connect PB2 to USB to Serial (RTS)

5. System Control and Ecosystem Access Area

The following figure shows the System Control and Ecosystem Access area on the EK-RX671 board. Subsequent sections detail the features and functionality provided in the area.

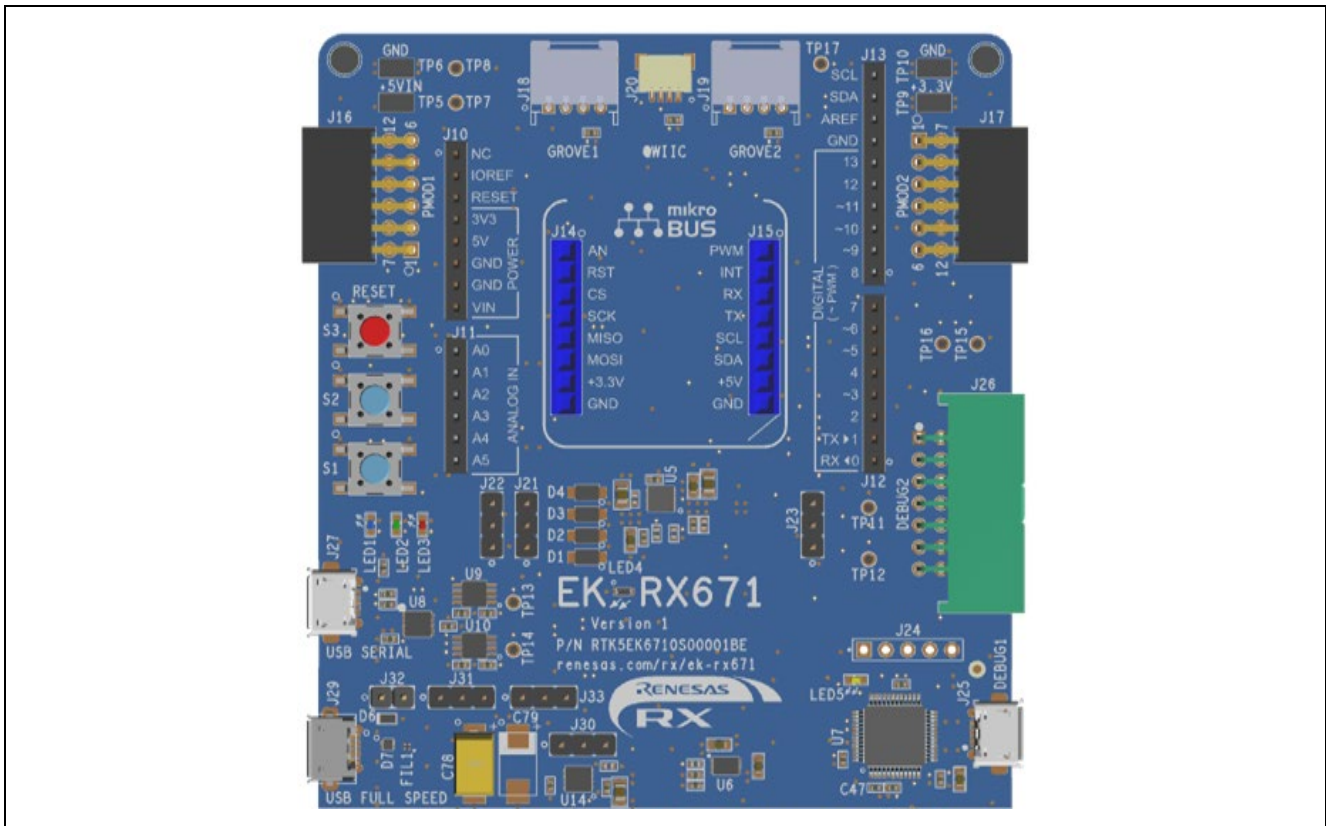


Figure 5-1. System Control and Ecosystem Access Area

5.1 Power

The EK-RX671 kit is designed for +5 V operation. An on-board Linear Regulator is used to convert the +5 V supply to +3.3 V and +1.8 V supply. The +3.3 V supply is used to power the RX MCU and other peripheral features. The +1.8 V supply is used to power the Audio codec IC.

5.1.1 Power Supply Options

This section describes the different ways in which EK-RX671 kit can be powered. Power from each source is connected to the Main System 5 V Power (+5 V). Reverse current protection is provided between each power input connector and the Main System 5 V Power so multiple power sources may be connected to the EK-RX671 board simultaneously.

Note: Power to the EK-RX671 board can't be supplied by external debugger (ex. E2 emulator Lite).

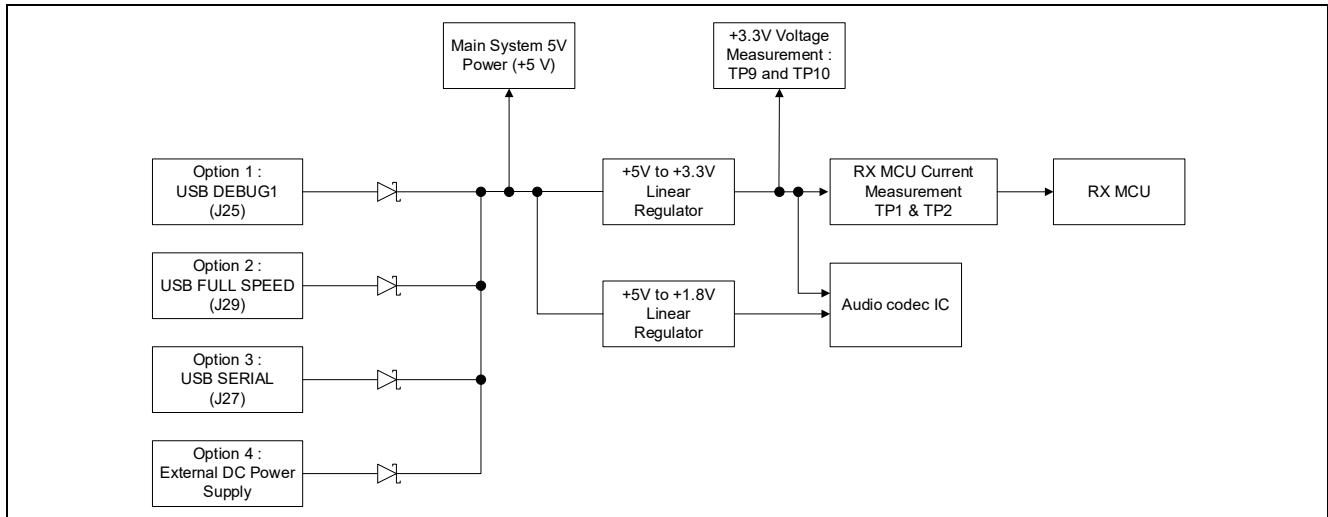


Figure 5-2. Power Supply Options

5.1.1.1 Option 1: USB DEBUG1

+5 V may be supplied from an external USB host to the USB connector (J25) labelled DEBUG1 on the board.

5.1.1.2 Option 2: USB FULL SPEED

+5 V may be supplied from an external USB host to the USB connector (J29) labelled USB FULL SPEED on the board.

5.1.1.3 Option 3: USB SERIAL

+5 V may be supplied from an external USB host to the USB connector (J27) labelled USB SERIAL on the board.

5.1.1.4 Option 4: External DC Power Supply

+5 V may be supplied from an external power supply to test points on the board. TP5 (+5 V) and TP6 (GND) are loop-style test points, and TP7 and TP8 are large via style test points. The two types of test points are electrically equivalent, and both are provided for user convenience.

5.1.2 Power Supply Considerations

Voltage of Main System 5 V Power will be lower than the power supply voltage because of the forward voltage (max 0.55V@1A) of the reverse current protection diode. Please note the voltage drop, because Main System 5 V Power is +5 V power source which supplies to external devices connected to Arduino, mikroBUS and USB Full Speed (when the USB Full Speed module of the RX MCU operates at host mode).

Note: The maximum current that could be supplied to the EK-RX671 is 1 A. Please be aware that the larger the current is, higher the temperature of reverse current protection diode and 3.3V linear regulator are.

5.1.3 Power-up Behavior

When powered, the white LED near the center of the board (the “dash” in the EK-RX671 name) will light up. For more details on initial power up behavior, see the *EK-RX671 Quick Start Guide*.

5.2 Debug

The EK-RX671 board supports the following two debug modes.

Table 5-1. Debug Modes

Debug Modes	Debug MCU (one that connects to the IDE on PC)	Target MCU (one that is being debugged)	Debugging Interface/Protocol	Connector Used
Debug on-board	E2 OB circuit	RX MCU (on-board)	FINE	USB DEBUG1 connector (J25)
Debug in	External debugging tools (ex. E2 emulator Lite)	RX MCU (on-board)	JTAG, FINE	14-pin male box header (J26)

Notes:

- See Table 5-3 for the USB DEBUG1 connector pin definition.
- See Table 5-7 for the 14-pin male box header definition.

The following table summarizes the DIP switch (S4) setting and the jumper setting for each of the debug modes.

Table 5-2. DIP switch and Jumper Connection Summary for Different Debug Modes

Debug Modes	S4 Pin1	S4 Pin2	J7	J8	J9
Debug on-board	OFF	OFF	Jumper on pins 2-3	Jumper on pins 2-3	Open
Debug in	OFF	ON	Jumper on pins 2-3	Jumper on pins 2-3	Open
Debug in with hot plug-in function ^{*1}	OFF	ON	Jumper on pins 1-2	Jumper on pins 2-3	Open

*1: The hot plug-in function is to allow the debugger to be connected during user system operation with "program execution continued", "no reset applied", and "program contents not modified". When you use hot plug-in, install a capacitor between the RES# and GND in order to suppress a noise to the RES# pin that would occur when the emulator is connected. However, rise time of RES# must be satisfied. Refer to the external debugger manual regarding the rise time. The EK-RX671 board provides through holes (TP15 and TP16) for installing the capacitor.

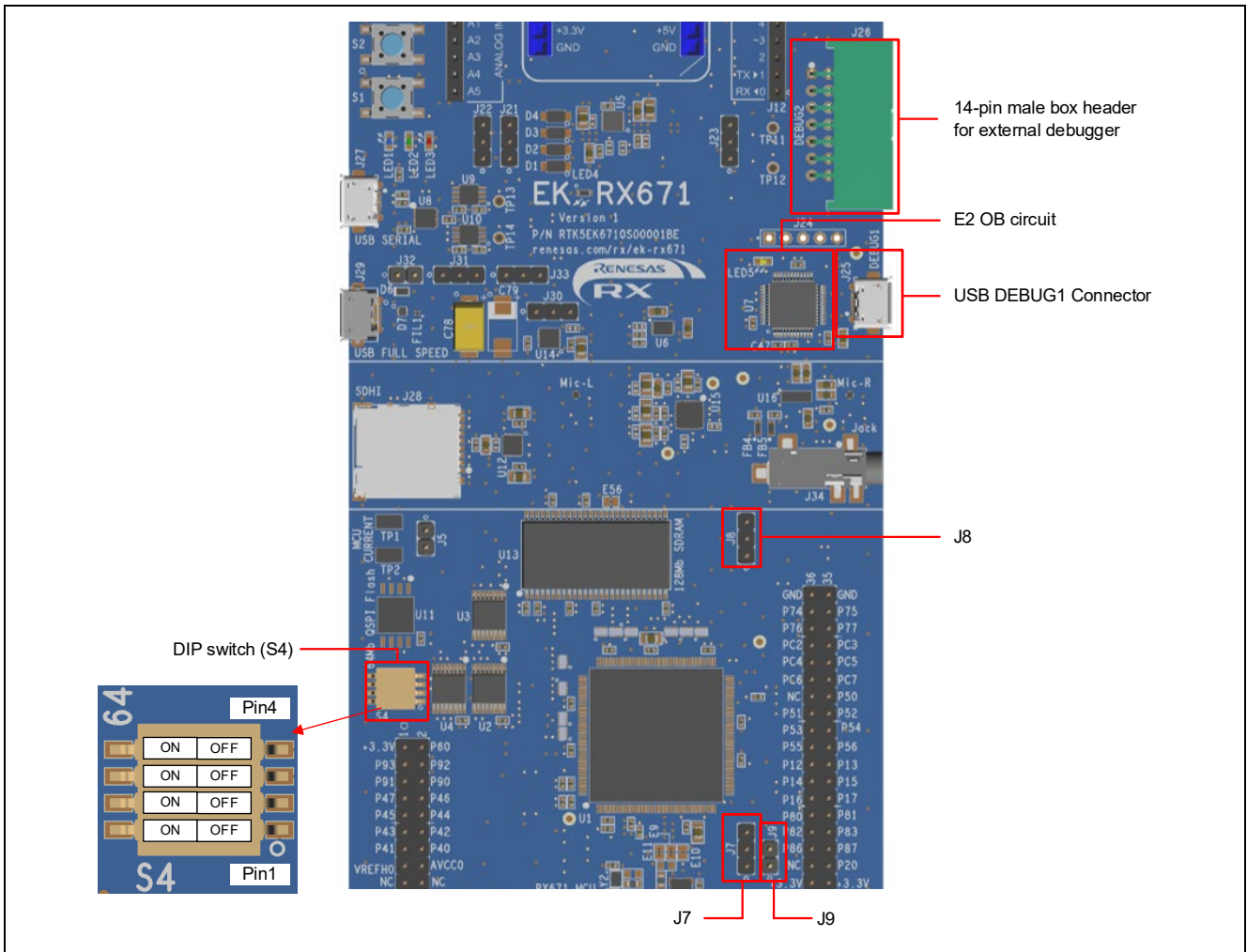


Figure 5-3. EK-RX671 Debug Interface

5.2.1 Debug On-Board

The debug on-board functionality is provided using E2 OB circuit on the EK-RX671 board. USB DEBUG1 connector (J25) connects the E2 OB circuit to a host PC, allowing re-programming and debugging of the target RX MCU firmware.

The E2 OB circuit connects to the target RX MCU using the FINE interface. Please note that connecting the same host PC to multiple EK-RX671 boards is not possible.

Table 5-3. USB DEBUG1 Connector

USB DEBUG1 Connector		EK-RX671
Pin	Description	Signal
J25-1	+5VDC	+5V_USB_DBG
J25-2	Data-	USBDBG_DM
J25-3	Data+	USBDBG_DP
J25-4	USB ID, jack internal switch, cable inserted	N.C.
J25-5	Ground	GND

A yellow indicator, LED5, shows the visual status of the debug interface. When the EK-RX671 board is powered on, and LED5 is blinking, it indicates that the host PC recognizes the E2 OB circuit. When LED5 is on solid, it indicates that the host PC is connected to the E2 OB circuit.

To configure the EK-RX671 board to use the Debug on-board mode, configure the DIP switch and the jumpers using the following table.

Table 5-4. Debug On-Board DIP switch and Jumper Configuration

Location	Configuration	Function
S4 Pin1	OFF	MD / FINED connected to +3.3 V through a pull-up resistor
S4 Pin2	OFF	E2 OB circuit enabled
J7	Jumper on pins 2-3	EMLE connected to GND through a pull-down resistor
J8	Jumper on pins 2-3	UB connected to GND through a pull-down resistor
J9	Open	UPSEL connected to +3.3 V through a pull-up resistor

5.2.2 Debug In

One 14-pin male box header at J26 supports JTAG and FINE debug. Either JTAG or FINE may be used for external debug of the target RX MCU.

Note: Power to the EK-RX671 board can't be supplied by external debugger (ex. E2 emulator Lite).

To configure the EK-RX671 board to use the Debug in mode, configure the DIP switch and the jumpers using the following table.

Table 5-5. Debug In Mode DIP switch and Jumper Configuration

Location	Configuration	Function
S4 Pin1	OFF	MD / FINED connected to +3.3 V through a pull-up resistor
S4 Pin2	ON	E2 OB circuit disabled
J7	Jumper on pins 2-3	EMLE connected to GND through a pull-down resistor
J8	Jumper on pins 2-3	UB connected to GND through a pull-down resistor
J9	Open	UPSEL connected to +3.3 V through a pull-up resistor

Table 5-6. Debug In with hot plug-in Mode DIP switch and Jumper Configuration

Location	Configuration	Function
S4 Pin1	OFF	MD / FINED connected to +3.3 V through a pull-up resistor
S4 Pin2	ON	E2 OB circuit disabled
J7	Jumper on pins 1-2	EMLE connected to +3.3 V through a pull-up resistor
J8	Jumper on pins 2-3	UB connected to GND through a pull-down resistor
J9	Open	UPSEL connected to +3.3 V through a pull-up resistor

Table 5-7. 14-pin male box header for external debugger

14-pin male box header for external debugger			EK-RX671
Pin	JTAG Pin Name	FINE Pin Name	Signal
J26-1	TCK	N.C.	P27
J26-2	GND	GND	GND
J26-3	TRST#	N.C.	P34
J26-4	EMLE	EMLE	EMLE
J26-5	TDO	N.C.	P26 ^{*1}
J26-6	N.C.	N.C.	N.C.
J26-7	MD	MD / FINED	MD_FINED
J26-8	+3.3 V	+3.3 V	+3.3 V
J26-9	TMS	N.C.	P31
J26-10	N.C.	N.C.	N.C.
J26-11	TDI	N.C.	P30 ^{*1}
J26-12	GND	GND	GND
J26-13	RES#	RES#	RES#
J26-14	GND	GND	GND

Note 1: The signals are available as TXD and RXD at using Renesas Flash Programmer.

5.3 Ecosystem

The System Control and Ecosystem area provides users the option to connect third party add-on modules compatible with five most popular ecosystems using the following connectors:

1. Two Seeed Grove® system (I2C / Analog) connectors
2. SparkFun® Qwiic® connector
3. Two Digilent Pmod™ (UART / SPI / I2C) connectors
4. Arduino® (Uno R3) connector
5. MikroElektronika mikroBUS™ connector

Note.1: We do not guarantee connection to all types of third party add-on modules. Confirm the specifications of this product against any third party add-on modules you intend to use.

Note.2: Third party add-on modules may not be able to connect the EK-RX671 board simultaneously because the RX MCU pins which are connected to third party add-on modules are multiplexed. Confirm the specifications of this product and RX671 Group User's Manual: Hardware.

5.3.1 Seeed Grove® Connectors

5.3.1.1 Grove 1

A Seeed Grove I2C connector is provided at J18. The RX MCU acts as a two-wire serial master, and a connected module acts as a two-wire serial slave. (Data lines shared with Arduino, mikroBUS, Pmod 1 and Qwiic.)

Table 5-8. Grove 1 Connector

Grove 1 Connector		EK-RX671
Pin	Description	Signal
J18-1	SCL	P12 (SCLHS0[FM+/HS]) ^{*1}
J18-2	SDA	P13 (SDAHS0[FM+/HS]) ^{*1}
J18-3	VCC	+3.3 V
J18-4	GND	GND

*1: The signals are shared with Arduino, mikroBUS, Pmod 1 and Qwiic.

5.3.1.2 Grove 2

A Seeed Grove I2C connector is provided at J19. The RX MCU acts as a two-wire serial master, and a connected module acts as a two-wire serial slave. Alternatively, this port can be configured to support two analog (ADC) inputs.

The pull-up resistors, R36 and R37, must be fitted when using I2C and removed when using as analog. The pull-up resistors may also be disconnected by cutting trace between pads of trace-cut jumper E33 and E34.

Table 5-9. Grove 2 Connector

Grove 2 Connector		EK-RX671
Pin	Description	Signal
J19-1	SCL / AN	P01 (SSCL6 / AN110) ^{*1}
J19-2	SDA / AN	P00 (SSDA6 / AN111) ^{*1}
J19-3	VCC	+3.3 V
J19-4	GND	GND

*1: The signals are shared with USB to serial interface.

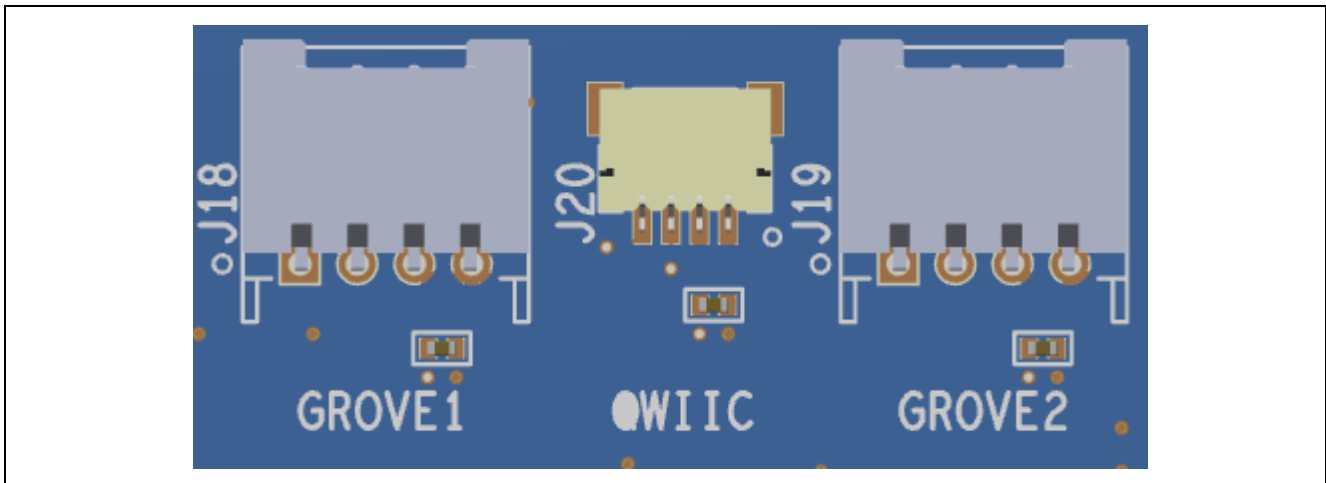


Figure 5-4. Seed Grove and SparkFun Qwiic Connectors

5.3.2 SparkFun® Qwiic® Connector

A SparkFun® Qwiic® connector is provided at J20. The RX MCU acts as a two-wire serial master, and a connected module acts as a two-wire serial slave. (Data lines shared with Arduino, mikroBUS, Pmod 1 and Grove 1.)

Table 5-10. Qwiic Connector

Qwiic Connector		EK-RX671
Pin	Description	Signal
J20-1	GND	GND
J20-2	VCC	+3.3V
J20-3	SDA	P13 (SDAHS0[FM+/HS]) ^{*1}
J20-4	SCL	P12 (SCLHS0[FM+/HS]) ^{*1}

*1: The signals are shared with Arduino, mikroBUS, Pmod 1 and Grove 1.

5.3.3 Digilent Pmod™ Connectors

Two 12-pin connectors are provided to support Pmod modules where the RX MCU acts as the master, and the connected module acts as a slave device.

These interfaces may be configured in firmware to support several Pmod types such as Type-2A (expanded SPI) and Type-3A (expanded UART).

5.3.3.1 Pmod 1

A 12-pin Pmod connector is provided at J16, Pmod 1.

Table 5-11. Pmod 1 Connector

Pmod 1 Connector			EK-RX671	Pmod 1 Configuration	
Pin	Description Type-2A / Type-3A	Option Type 6A	Signal	Short	Open
J16-1	CS / CTS / GPIO	INT	P83 (CTS010# / IRQ3) ^{*3 *4}		
J16-2	MOSI / TXD	RESET	P82 (TXD010 / SMOSI010) ^{*3 *4 *5}		
J16-3	MISO / RXD		P86 (RXD010 / SMISO010) ^{*3 *4}	J21 Pin 1-2	
		SCL	P12 (SCLHS0[FM+/HS]) ^{*2 *6}	J21 Pin 2-3	
J16-4	SCK / RTS / GPIO		P80 (SCK010 / RTS010#) ^{*3 *4}	J22 Pin 1-2	
		SDA	P13 (SDAHS0[FM+/HS]) ^{*2 *6}	J22 Pin 2-3	
J16-5	GND		GND		
J16-6	VCC		+3.3 V	E24	E25
			+5 V ^{*1}	E25	E24
J16-7	GPIO / INT (slave to master)		P32 (IRQ2-DS) ^{*3}	E27	
J16-8	GPIO / RESET (master to slave)		P47	E28	
J16-9	GPIO / CS2		P15	E29	
J16-10	GPIO / CS3		P72	E30	
J16-11	GND		GND		
J16-12	VCC		+3.3 V	E24	E25
			+5 V ^{*1}	E25	E24

*1: Either +3.3 V or +5 V can be selected. Default configuration is +3.3 V. The Type-6A (I2C) may support +5 V devices, however, ensure that Pmod 1 signals are isolated other than I2C because some RX MCU ports which are connected to Pmod1 are not 5 V tolerant.

*2: Open at shipping.

*3: The signals are shared with Arduino.

*4: The signals are shared with mikroBUS.

*5: The signal is shared with LED2.

*6: The signals are shared with Arduino, mikroBUS, Qwiic and Grove 1.

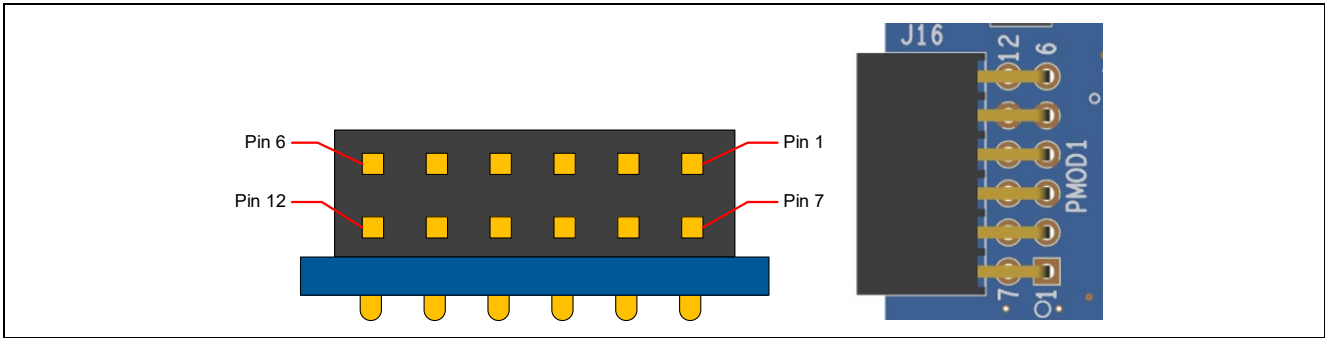


Figure 5-5. Pmod 1 connector

Pmod 1 Type-6A connection

The option for Type-6A (I2C) can be configured at Pmod1 and supports +3.3 V / +5 V devices. To configure the EK-RX671 board to use the I2C devices with +3.3 V / +5 V operation, configure the pin header jumpers and the copper jumpers using Table 5-11. Following figures show the pin header jumpers and copper jumpers to use the I2C devices.

Note: Exercise caution while modifying power source trace jumpers, E24 and E25. Permanent damage to the EK-RX671 board and/or connected modules may result.

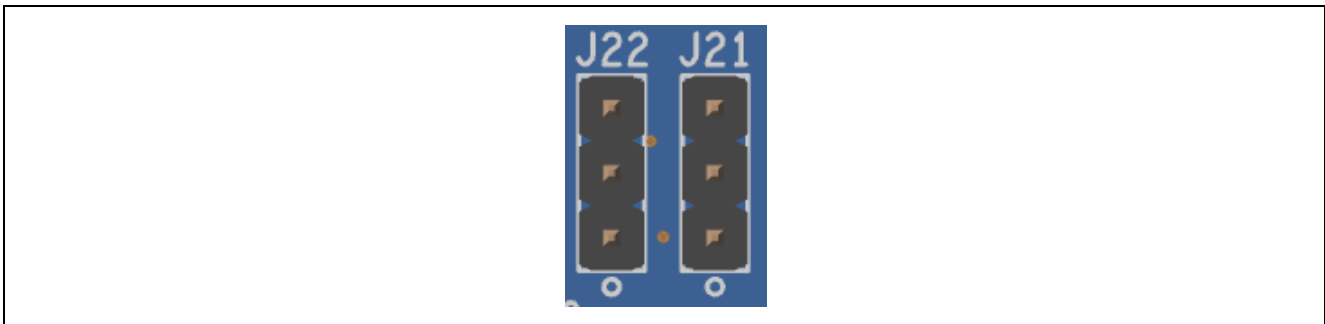


Figure 5-6. Pmod 1 Pin header jumpers (top side)

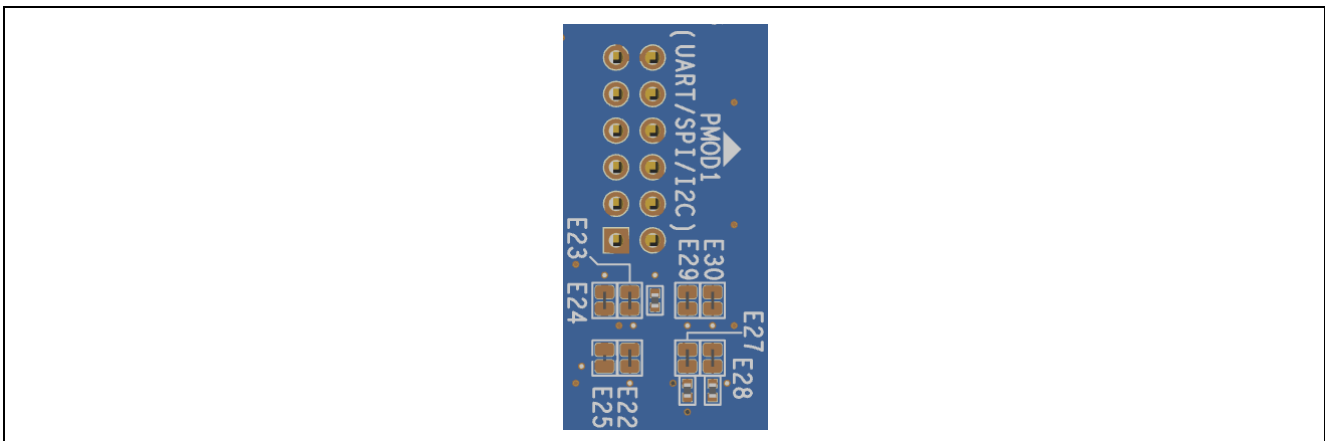


Figure 5-7. Pmod 1 Copper jumpers (bottom side)

5.3.3.2 Pmod 2

A 12-pin Pmod connector is provided at J17, Pmod 2.

Table 5-12. Pmod 2 Connector

Pmod 2 Connector			EK-RX671	Pmod 2 Configuration	
Pin	Description Type-2A / Type-3A	Option Type 6A	Signal	Short	Open
J17-1	CS / CTS / GPIO	INT	P74 (CTS011# / IRQ12)		
J17-2	MOSI / TXD	RESET	P77 (TXD011 / SMOSI011)		
J17-3	MISO / RXD	SCL	P76 (RXD011 / SMISO011 / SSCL011)		
J17-4	SCK / RTS / GPIO		P75 (SCK011 / RTS011#)	J23 Pin 1-2	
		SDA	PB7 (SSDA011) *1	J23 Pin 2-3	
J17-5	GND		GND		
J17-6	VCC		+3.3V		
J17-7	GPIO / INT (slave to master)		P46 (IRQ14-DS)		
J17-8	GPIO / RESET (master to slave)		PC0		
J17-9	GPIO / CS2		PC1		
J17-10	GPIO / CS3		PC2		
J17-11	GND		GND		
J17-12	VCC		+3.3V		

*1: Open at shipping.

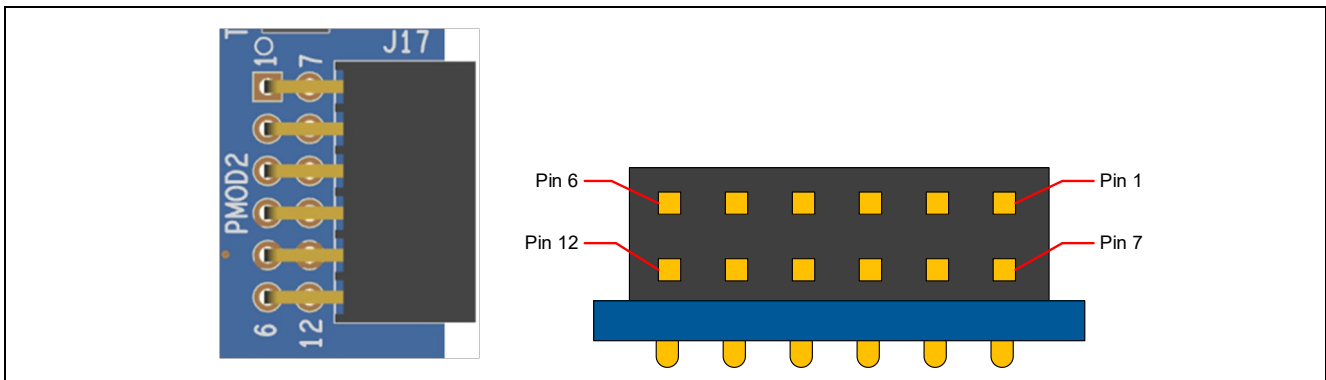


Figure 5-8. Pmod 2 connector

Pmod 2 Type-6A connection

The option for Type-6A (I2C) can be configured at Pmod2 and supports +3.3 V devices. To configure the EK-RX671 board to use the I2C devices with +3.3 V operation, configure the pin header jumper using Table 5-12. Following figures show the pin header jumper to use the I2C devices.

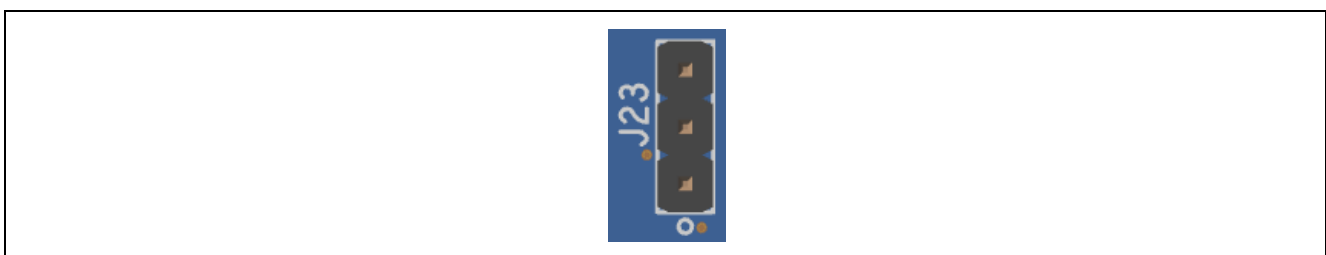


Figure 5-9. Pmod 2 Pin header jumpers (top side)

5.3.4 Arduino® Connector

Near the center of the System Control and Ecosystem Access area is an Arduino Uno R3 compatible connector interface.

Table 5-13. Arduino Uno Connections

Arduino Compatible Connector				EK-RX671	Configuration	
Pin	Description			Signal	Short	Open
J10-1	NC			NC		
J10-2	IOREF			+3.3V		
J10-3	RESET			RES#	E52	E53
				P02 *1	E53	E52
J10-4	+3.3 V			+3.3V		
J10-5	+5 V			+5V *1	E57	
J10-6	GND			GND		
J10-7	GND			GND		
J10-8	VIN			NC		
J11-1	A0			P40 (AN000) *2		
J11-2	A1			P41 (AN001)		
J11-3	A2			P42 (AN002)		
J11-4	A3			P43 (AN003)		
J11-5	A4			P44 (AN004)		
J11-6	A5			P45 (AN005)		
J12-1	D0	RXD		PC6 (RXD10) *2		
J12-2	D1	TXD		PC7 (TXD10) *2 *3	E49	E50
				P71 *1	E50	E49
J12-3	D2	INT0		P05 (IRQ13)		
J12-4	D3	INT1	PWM	P87 (TIOCA2 / IRQ15)		
J12-5	D4			P93		
J12-6	D5		PWM	P25 (TIOCA4) *8		
J12-7	D6		PWM	P32 (MTIOC0C) *4		
J12-8	D7			P55		
J13-1	D8			PJ5		
J13-2	D9		PWM	P56 (MTIOC3C) *2 *6		
J13-3	D10	SPI_SS	PWM	P83 (SS010# / MTIOC4C) *2 *4		
J13-4	D11	SPI_MOSI	PWM	P82 (SMOSI010 / MTIOC4A) *2 *4 *7		
J13-5	D12	SPI_MISO		P86 (SMISO010) *2 *4		
J13-6	D13	SPI_SCK		P80 (SCK010) *2 *4		
J13-7	GND			GND		
J13-8	AREF			VREFH0		
J13-9	I2C_SDA			P13 (SDAHS0[FM+/HS]) *5		
J13-10	I2C_SCL			P12 (SCLHS0[FM+/HS]) *5		

*1: Open at shipping.

*2: The signals are shared with mikroBUS.

*3: The signal is shared with UB.

*4: The signals are shared with Pmod 1.

*5: The signals are shared with Pmod 1, mikroBUS, Qwiic and Grove 1.

*6: The signal is shared with LED1.

*7: The signal is shared with LED2.

*8: The signal is shared with LED3.

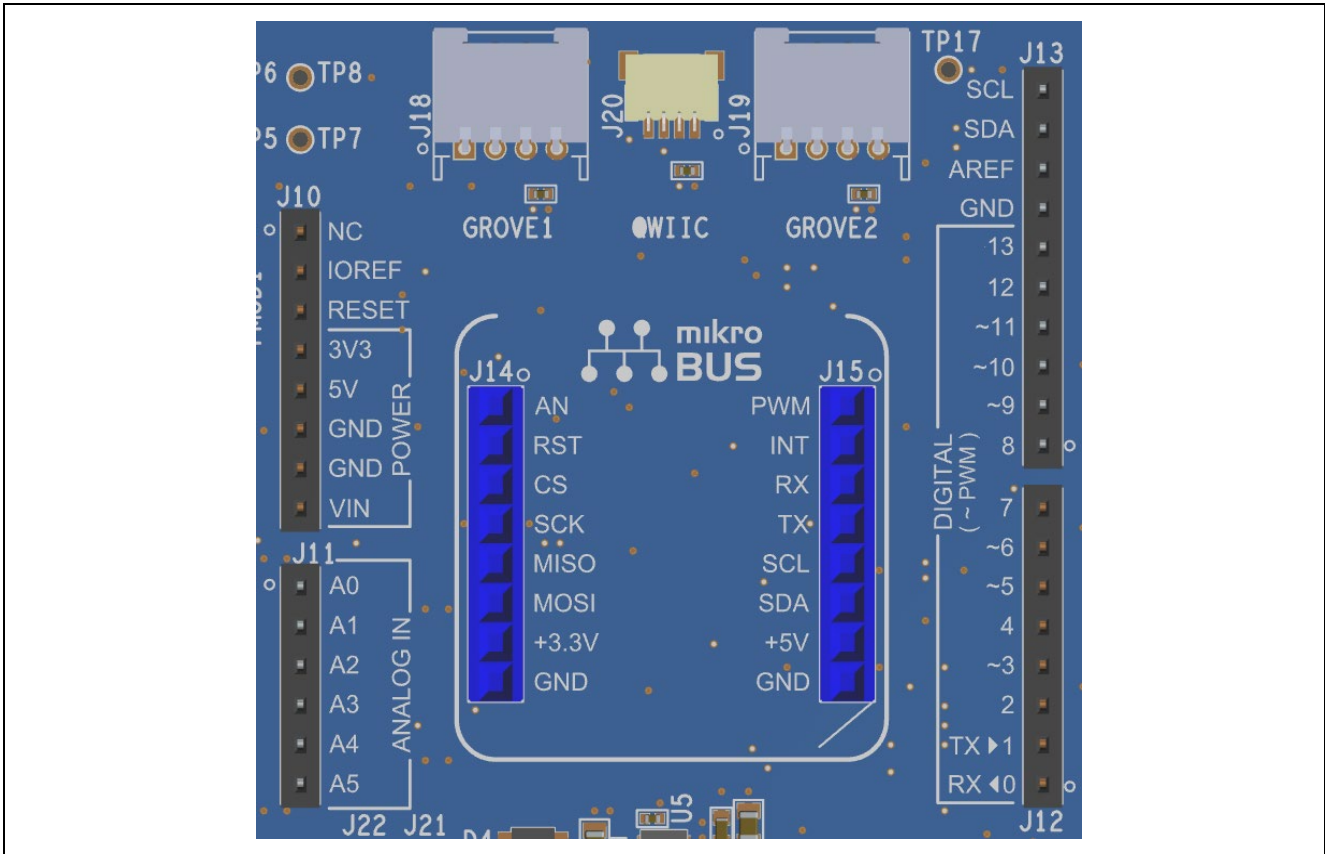


Figure 5-10. Arduino Uno Connectors (J10, J11, J12 and J13)

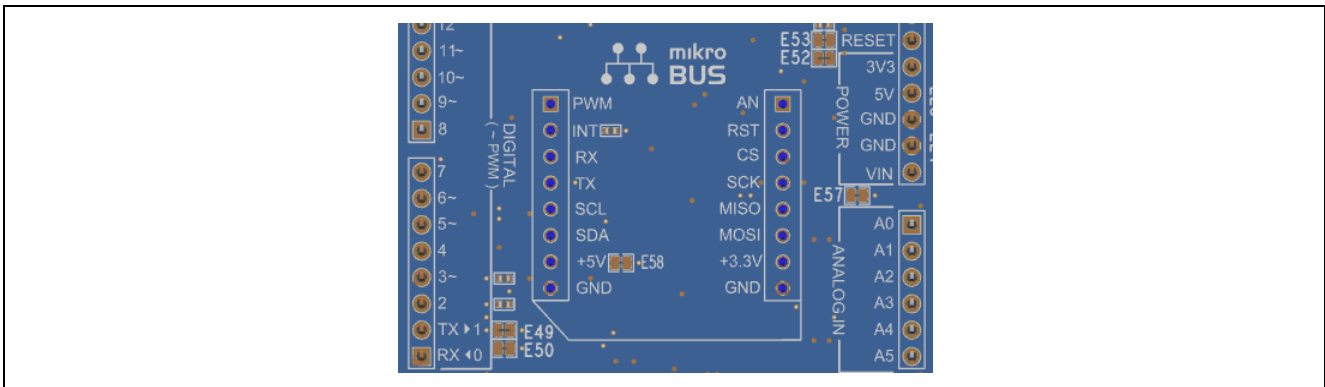


Figure 5-11. Arduino Uno Copper jumpers (bottom side)

Arduino Shield Considerations

AREF (J13-Pin 8) output from Arduino Shield can supply +3.3V power to VREFH0 (Analog reference voltage supply pin for the 12-bit A/D converter) of RX MCU, however, on-board LDO supplies +3.3 V power to VREFH0 at default condition. When Arduino AREF supplies +3.3V power to VREFH0, the user must disconnect VREFH0 from on-board +3.3 V power. Copper jumper E44 is provided on the EK-RX671 board to disconnect VREFH0 from on-board +3.3 V power.

The EK-RX671 board can supply +5 V power to J10-Pin 5 of Arduino Shield by shorting copper jumper E57, however, some of the RX MCU pins which are connected to Arduino Shield are not 5 V tolerant. When the EK-RX671 board supplies +5 V power to Arduino Shield, the user must confirm the RX671 Group User's Manual: Hardware and the specification of Arduino Shield you intend to use.

5.3.5 MikroElektronika mikroBUS™ Connector

In the center of the System Control and Ecosystem Access area is a mikroBUS compatible connector interface. This interface is compliant with mikroBUS Standard Specifications revision 2.00.

Table 5-14. mikroBUS Connections

mikroBUS Connector		EK-RX671	Configuration	
Pin	Description	Signal	Short	Open
J14-1	AN (Analog)	P40 (AN000) ^{*2}		
J14-2	RST (Reset)	P03		
J14-3	CS (SPI Chip Select)	P83 (SS010#) ^{*2 *3}		
J14-4	SCK (SPI Clock)	P80 (SCK010) ^{*2 *3}		
J14-5	MISO	P86 (SMISO010) ^{*2 *3}		
J14-6	MOSI	P82 (SMOSI010) ^{*2 *3 *7}		
J14-7	+3.3 V	+3.3V		
J14-8	GND	GND		
J15-1	PWM	P56 (MTIOC3C) ^{*2 *6}		
J15-2	INT (Hardware Interrupt)	P91 (IRQ9)		
J15-3	RX (UART Receive)	PC6 (RXD10) ^{*2}		
J15-4	TX (UART Transmit)	PC7 (TXD10) ^{*2 *4}		
J15-5	SCL (I2C Clock)	P12 (SCLHS0[FM+/HS]) ^{*5}		
J15-6	SDA (I2C Data)	P13 (SDAHS0[FM+/HS]) ^{*5}		
J15-7	+5 V	+5V ^{*1}	E58	
J15-8	GND	GND		

*1: Open at shipping.

*2: The signals are shared with Arduino.

*3: The signals are shared with Pmod 1.

*4: The signal is shared with UB.

*5: The signals are shared with Pmod 1, mikroBUS, Qwiic and Grove 1.

*6: The signal is shared with LED1.

*7: The signal is shared with LED2.

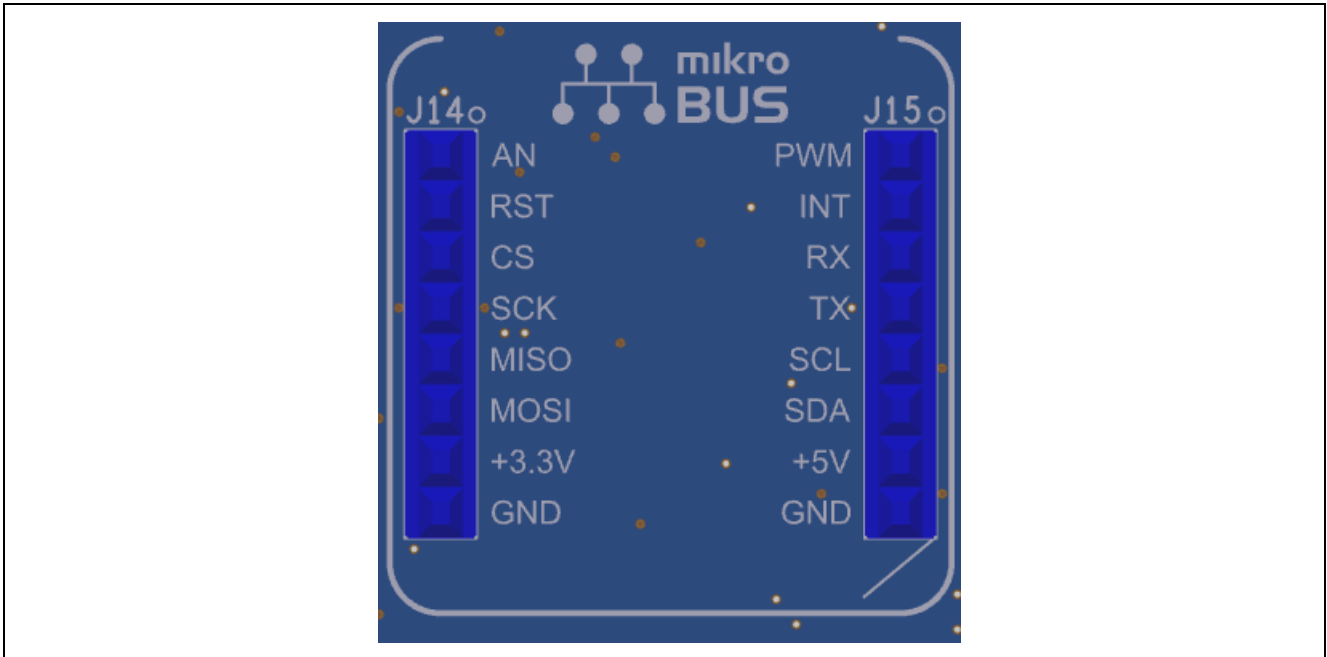


Figure 5-12. mikroBUS Connectors

mikroBUS CLICK BOARD™ Considerations

The EK-RX671 board can supply +5 V power to J15-Pin 7 of mikroBUS CLICK BOARD by shorting copper jumper E58, however, some of the RX MCU pins which are connected to mikroBUS CLICK BOARD are not 5 V tolerant. When the EK-RX671 board supplies +5 V power to mikroBUS CLICK BOARD, the user must confirm the RX671 Group User's Manual: Hardware and the specification of mikroBUS CLICK BOARD you intend to use.

5.4 Connectivity

5.4.1 USB to Serial

The USB Micro-B connector (J27) connects the RX MCU SCI interface to an external USB interface through FTDI FT234XD-T (U8) with maximum baud rate of 3Mbps. The RX MCU SCI can be configured either SCI6 (default configuration) or SCI1. Power from an external USB Host on this connection can be used to provide power to the EK-RX671 board.

Table 5-15. USB to Serial Connector

USB to Serial Connector		EK-RX671
Pin	Description	Signal
J27-1	+5 VDC	+5V_USB_SER
J27-2	Data-	USB_DM
J27-3	Data+	USB_DP
J27-4	USB ID, jack internal switch, cable inserted	N.C.
J27-5	Ground	GND

Table 5-16. FT234XD-T and RX MCU Connection

FT234XD-T		EK-RX671		Configuration	
Pin	Description	Signal	Function	Short	Open
U8-10	RXD	P26 (TXD1) ^{*1}	SCI 1 Transmit Data	E36	E35
		P00 (TXD6)	SCI 6 Transmit Data	E35	E36
U8-7	TXD	P30 (RXD1) ^{*1}	SCI 1 Receive Data	E38	E37
		P01 (RXD6)	SCI 6 Receive Data	E37	E38
U8-8	RTS#	PF5 (IRQ4) ^{*2}	Clear to Send	E55	E56
		PB2 (CTS6#) ^{*1}	SCI 6 Clear to Send	E56	E55
U8-11	CTS#	PJ3 (RTS6#)	Request to Send		

*1: Open at shipping.

*2: The signal is substitute signal of PB2(CTS6#).

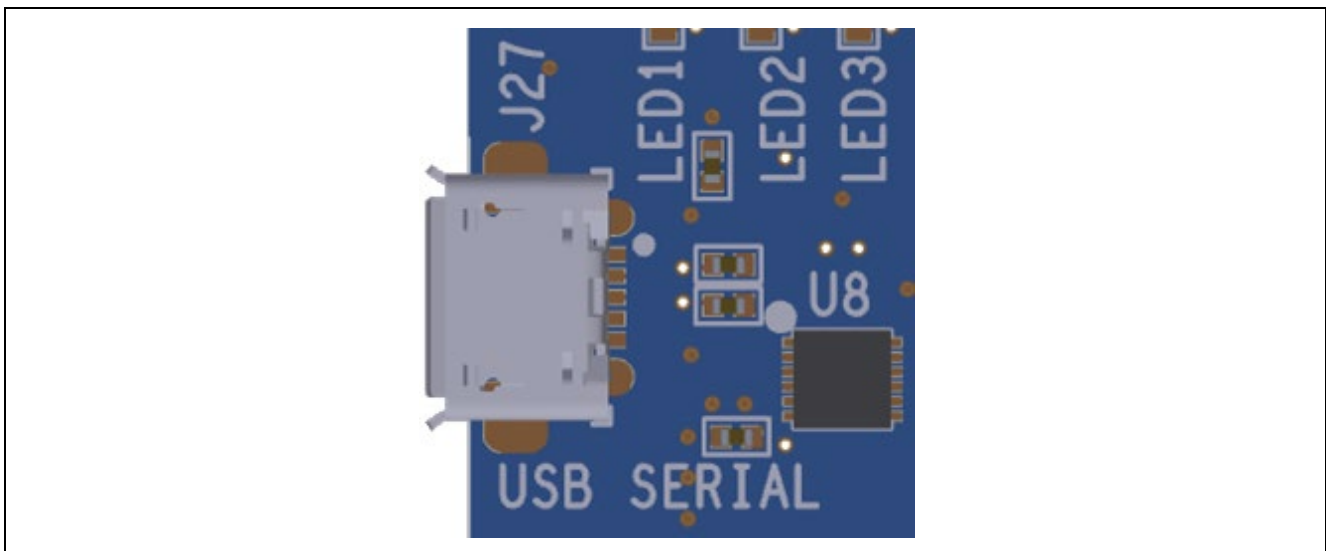


Figure 5-13. USB to Serial Connector

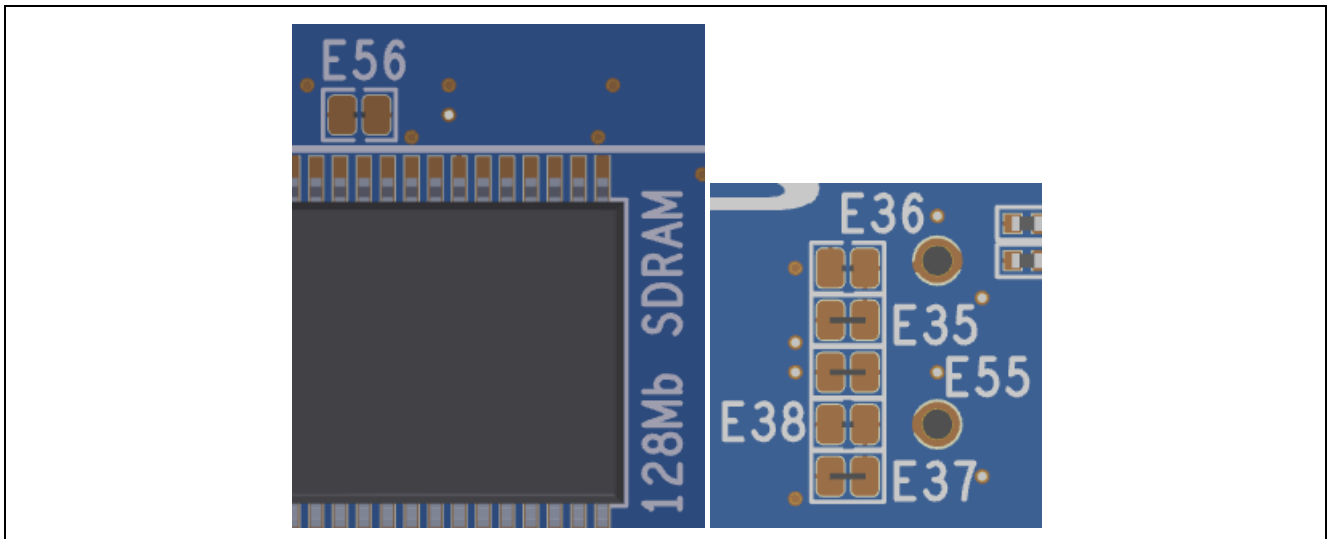


Figure 5-14. USB to Serial Copper jumpers (E56: top side, Others: bottom side)

The user must install FTDI Virtual COM Port (VCP) driver from FTDI's web site to use FT234XD-T.

<https://ftdichip.com/>

5.4.2 USB Full Speed

The USB Micro-AB connector (J29) connects the RX MCU USB Full Speed interface to an external USB interface, allowing communications for testing and use of the RX MCU firmware. This connection can be configured as either an USB Function or an USB Host interface.

The USB Function mode can be configured as either bus-power or self-power mode. For the USB Function configuration (with bus-power mode or self-power mode), set jumpers according to Table 5-18, and configure the RX MCU firmware to use the USB Full Speed ports in function mode. Power from an external USB Host on this connection can be used to provide power to the EK-RX671 board.

For the USB Host configuration, set jumpers according to Table 5-18, and configure the RX MCU firmware to use the USB Full Speed ports in host mode. In this configuration, power to J29 is supplied from U14 (Power supply IC). The total current available from U14 is 500 mA. To enable U14 and monitor overcurrent detection of U14, configure the RX MCU firmware according to Table 5-19. Note that the input power sources must be configured with enough power for both the EK-RX671 board and the USB Full Speed port in host mode. Connect the included USB type-A female to micro-B male cable to J29. USB function cables or function can be connected to the USB Full Speed port using this cable.

Table 5-17. USB Full Speed Connector

USB Full Speed Connector		EK-RX671
Pin	Description	Signal
J29-1	+5 VDC	+5V_USBFS (Function Mode) +5V_H_USBFS (Host Mode)
J29-2	Data-	PH2 (USB0_DM)
J29-3	Data+	PH1 (USB0_DP)
J29-4	USB ID, jack internal switch, cable inserted	N.C.
J29-5	Ground	GND

Table 5-18. USB Full Speed Pin Header Jumper Configuration

USB Operating Mode		J30	J31	J32	J33
Host Mode		Jumper on pins 2-3	Jumper on pins 1-2	Open	Don't care
Function Mode	Bus-power	Jumper on pins 1-2	Jumper on pins 2-3	Short	Jumper on pins 1-2
	Self-power	Jumper on pins 1-2	Jumper on pins 2-3	Open	Jumper on pins 2-3

Table 5-19. USB FS Power Supply IC

U14 Power Supply IC		EK-RX671
Pin	Function	Signal
U14-3	VBUS supply enable signal	P16 (USB0_VBUS / USB0_VBUSEN) *1
U14-8	Overcurrent detection signal	P14 (USB0_OVRCURA)

*1: USB0_VBUSEN is multiplexed with USB0_VBUS (USB cable connection monitor). At using Function mode, configure the RX MCU firmware to use USB0_VBUS and set the pin header jumpers according to Table 5-18.

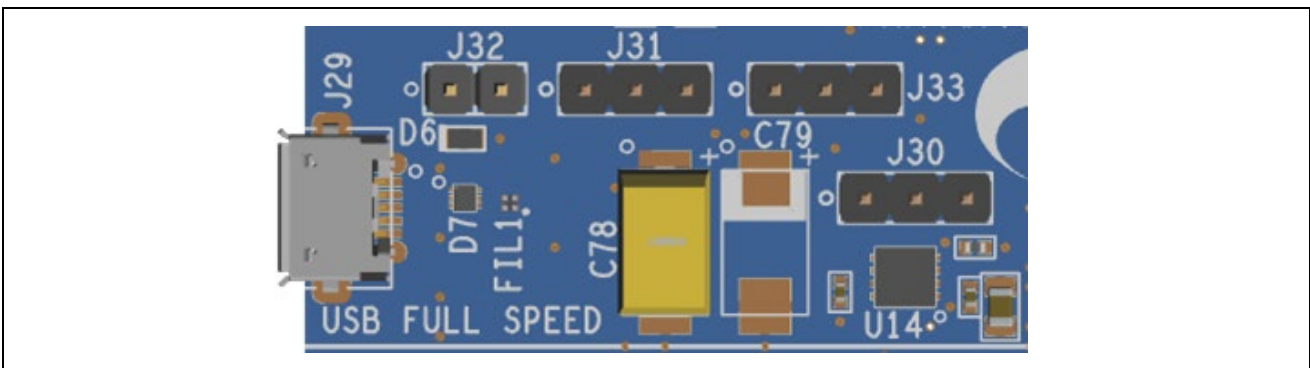


Figure 5-15. USB Full Speed Connector

5.5 Miscellaneous

5.5.1 LED

5 LEDs are provided on the EK-RX671 board.

Behavior of the LEDs on the EK-RX671 board is described in the following table. User LEDs are active high on the RX MCU ports.

Table 5-20. EK-RX671 Board LED Functions

LED			EK-RX671	Configuration	
Designator	Color	Function	Signal	Short	Open
LED1	Blue	User LED	P56 (MTIOC3C)	E15	
LED2	Green	User LED	P82 (MTIOC4A)	E16	
LED3	Red	User LED	P25 (TIOCA4)	E17	
LED4	White	Power on indicator	+3.3V		
LED5	Yellow	Debug LED	E2 OB circuit		

The User LEDs may be isolated from the Main MCU, so the associated ports can be used for other purposes. To separate LED1 from P56, Trace Cut Jumper E15 must be open. To separate LED2 from P82, Trace Cut Jumper E16 must be open. To separate LED3 from P25, Trace Cut Jumper E17 must be open.

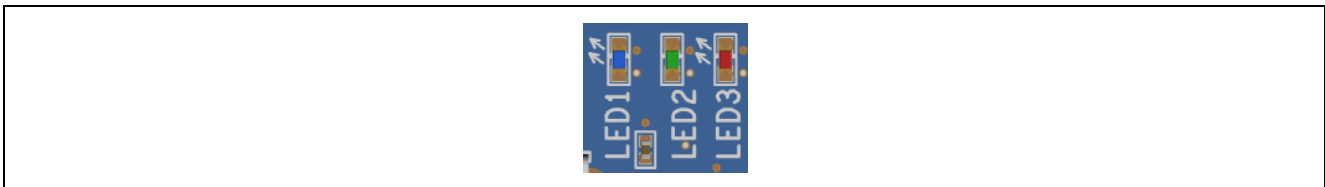


Figure 5-16. User LEDs



Figure 5-17. Power LED

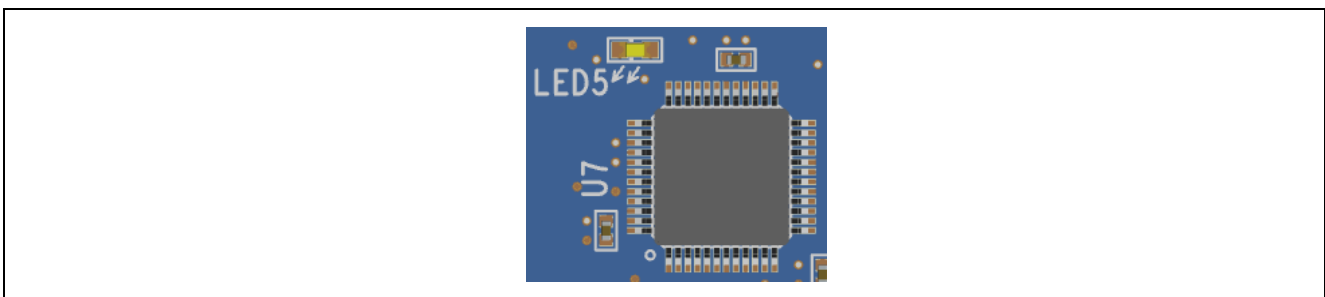


Figure 5-18. Debug LED

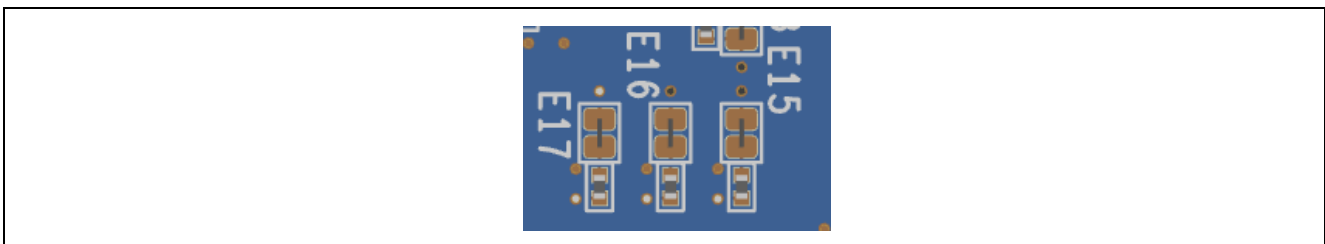


Figure 5-19. User LEDs Copper jumpers (bottom side)

5.5.2 User and Reset Switches

Three miniature, momentary, mechanical push-button type SMT switches are mounted on the EK-RX671 board.

Pressing the Reset switch (S3) generates a reset signal to restart the RX MCU.

Table 5-21. EK-RX671 Board Switches

Switch			EK-RX671	Configuration	
Designator	Function	Color	Signal	Short	Open
S3	MCU Reset Switch	Red	RES#		
S2	User Switch	Blue	PC5 (IRQ5)	E14	
S1	User Switch	Blue	PC3 (IRQ11)	E13	

The User Switches S1 and S2 may be isolated from the RX MCU, so the associated ports can be used for other purposes. To separate S1 from PC3, Trace Cut Jumper E13 must be open. To separate S2 from PC5, Trace Cut Jumper E14 must be open.

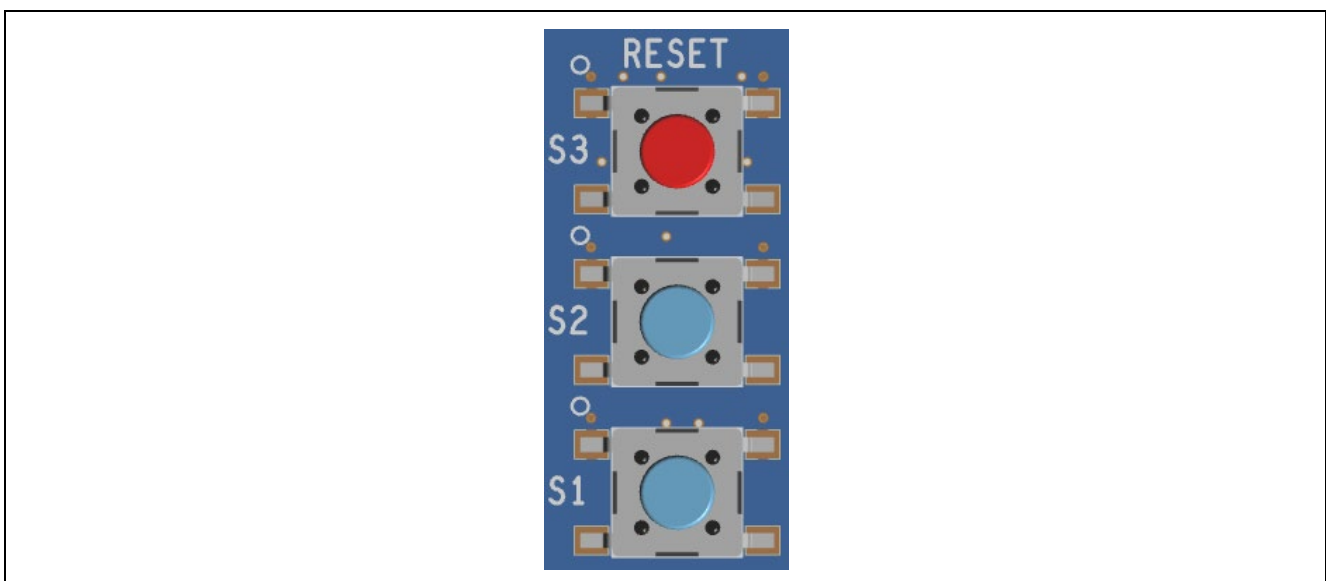


Figure 5-20. Reset and User Switches

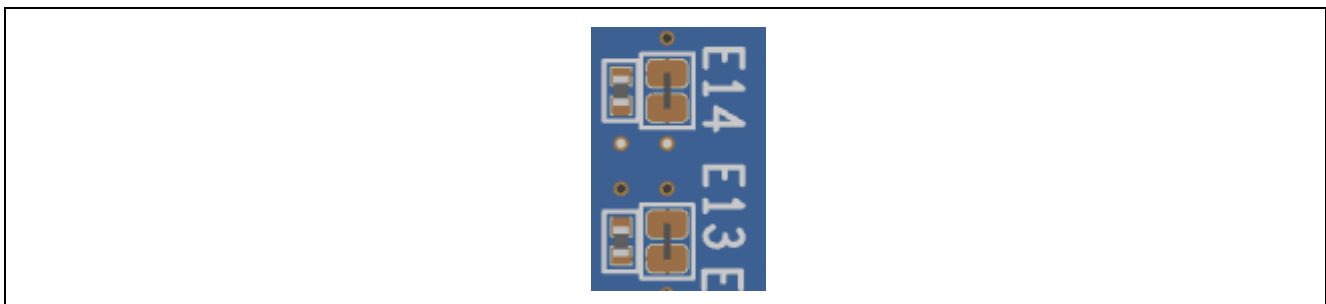


Figure 5-21. User switches Copper jumpers (bottom side)

6. Special Feature Access Area

The Special Feature Access area provides features specific to the RX MCU group such as SDHI, Audio interface, SDRAM controller, QSPIX and Touch interface.

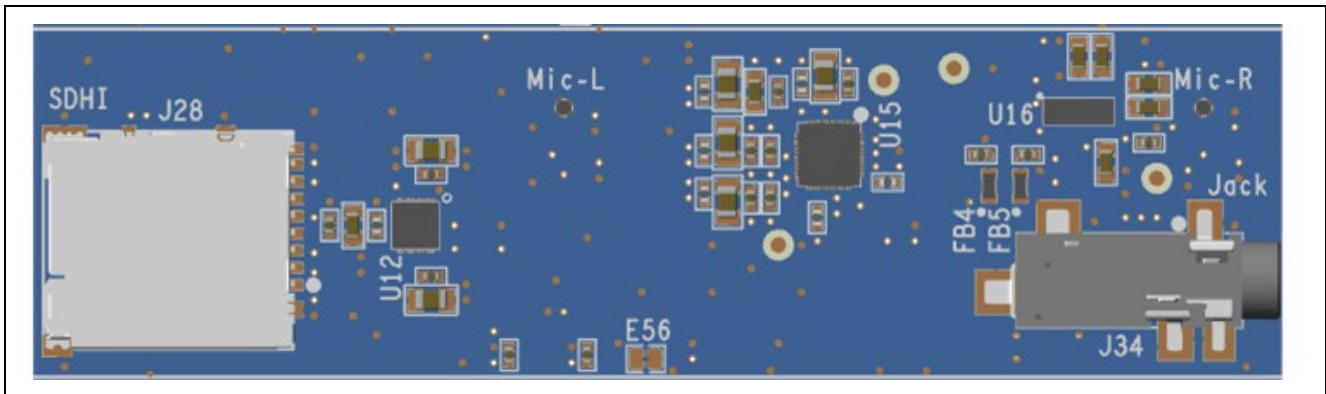


Figure 6-1. Special Feature Access Area

6.1 SD Host Interface (SDHI)

The microSD card slot (J28) connects the RX MCU SDHI to a microSD card, allowing communications for testing and use of the RX MCU firmware. Refer to RX671 Group User's Manual: Hardware about details of SDHI specification.

SW_A and SW_B are pins of a card detection switch in the microSD card slot. The switch between SW_A and SW_B closes when a microSD card is inserted into the card slot.

The microSD card cannot be configured with external SDRAM and QSPI flash memory simultaneously because RX MCU pins of these functions are multiplexed. Refer to section 7.4 to select microSD card.

Power (+3.3 V) to the microSD card is supplied from U12 (Power supply IC). To enable U12 and monitor overcurrent detection of U12, configure the RX MCU firmware according to Table 6-2.

Table 6-1. SDHI Connection

microSD Card Slot		EK-RX671	RX MCU
Pin	Description	Signal	Port
J28-1	DAT2	SDHI_D2-B	PD2
J28-2	CD / DATA3	SDHI_D3-B	PD3
J28-3	CMD	SDHI_CMD-B	PD4
J28-4	VDD	+3V3_SD	-
J28-5	CLK	SDHI_CLK-B	PD5
J28-6	VSS	GND	-
J28-7	DAT0	SDHI_D0-B	PD6
J28-8	DAT1	SDHI_D1-B	PD7
J28-9	SW_A	GND	-
J28-10	SW_B	P81 (SDHI_CD)	P81

Table 6-2. SDHI Power Supply IC

U12 Power Supply IC		EK-RX671
Pin	Function	Signal
U12-3	+3V3_SD supply enable signal	P51
U12-8	Overcurrent detection signal	P73 (IRQ8)

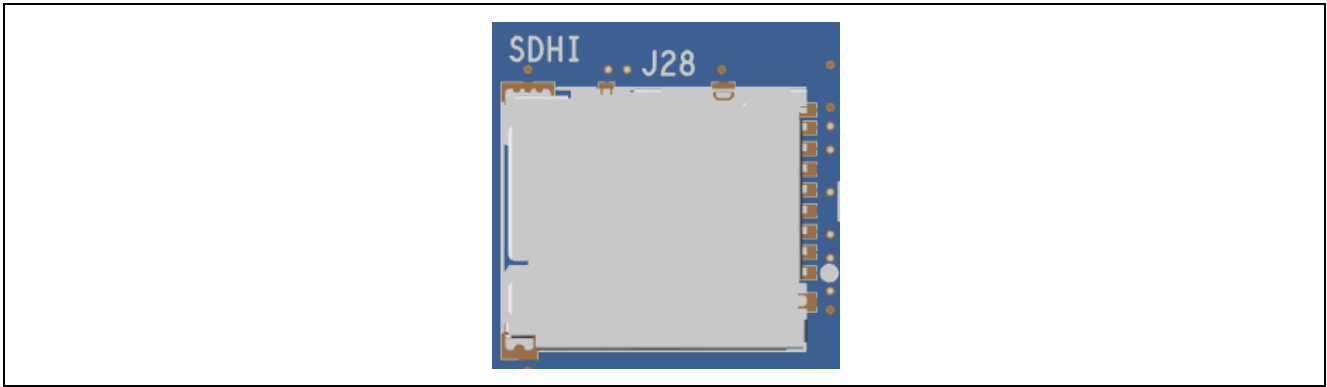


Figure 6-2. microSD card slot

6.2 Audio Interface

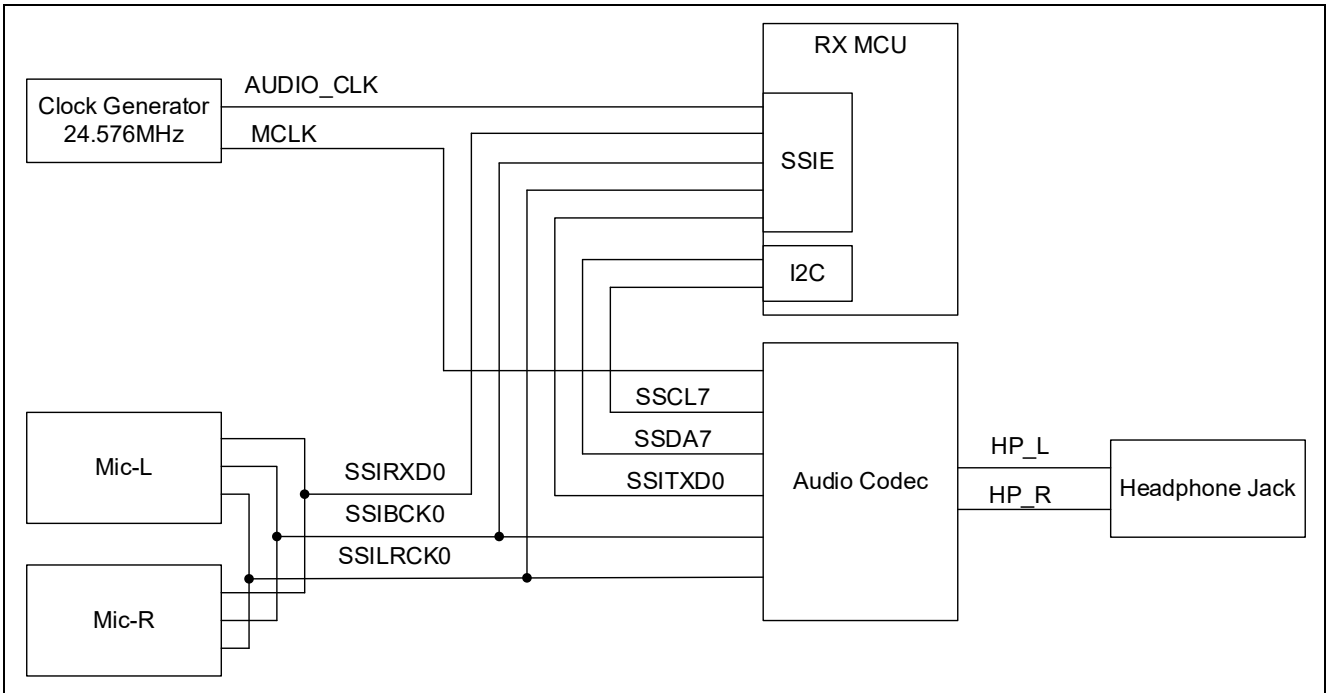


Figure 6-3. Block Diagram for Audio Interface

An audio codec IC, a clock generator IC for audio, 2 microphones (Microphone-Left and Microphone-Right) and a headphone jack (3.5 mm, stereo, audio jack) are provided on the EK-RX671 board. The RX MCU incorporates Serial Sound Interface (SSIE).

Table 6-3. Clock Generator Connection

EK-RX671		RX MCU
Signal	Function	Port
AUDIO_CLK	Audio Clock	P22
MCLK	Master Clock	-

Table 6-4. Audio Codec Connection

EK-RX671		RX MCU
Signal	Function	Port
SSILRCK0	Mic-L / Mic-R Channel Select	P21
SSIBCK0	Bit Clock	P23
SSITXD0	Data Output	P17
SSCL7	Control Interface Clock	P92
SSDA7	Control Interface Data	P90

Table 6-5. Microphone Connection

EK-RX671		RX MCU
Signal	Function	Port
SSILRCK0	Mic-L / Mic-R Channel Select	P21
SSIBCK0	Bit Clock	P23
SSIRXD0	Data Input	P20

Table 6-6. Headphone Jack Connection

EK-RX671		RX MCU
Signal	Function	Port
HP_L	Headphone Output (Left)	-
HP_R	Headphone Output (Right)	-

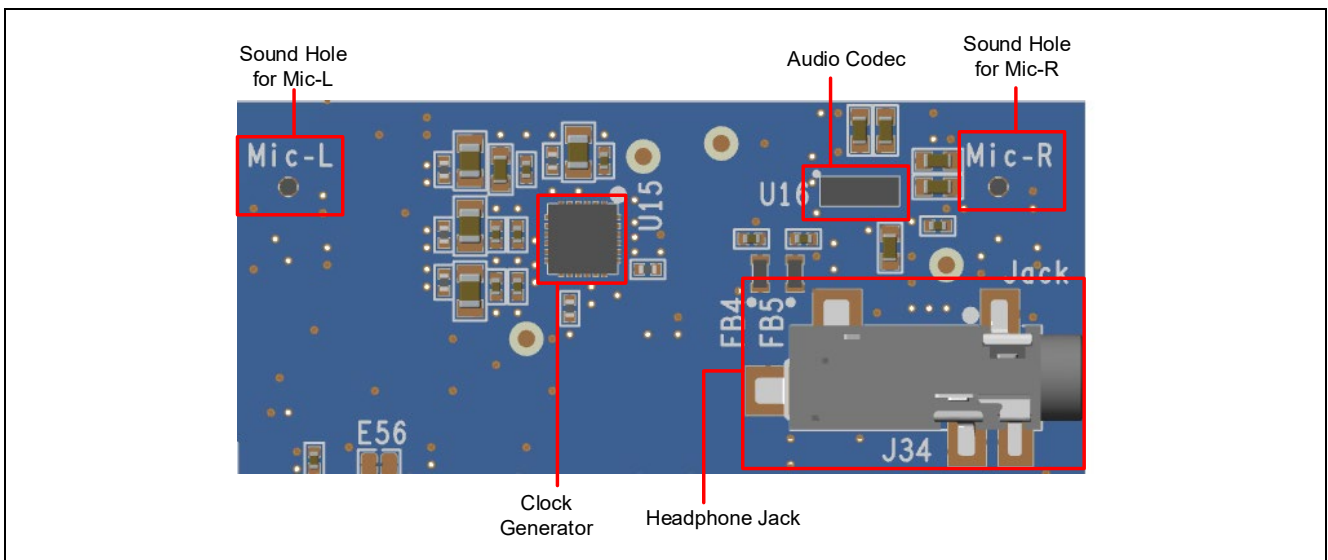


Figure 6-4. Audio Interface

6.3 SDRAM

Included on the EK-RX671 board is an Alliance Memory 128 Mbit Synchronous DRAM (AS4C8M16SA) with a 16-bit width. The external SDRAM (U13) is connected to the SDRAM controller on the RX MCU.

The external SDRAM cannot be configured with Quad-SPI and microSD card simultaneously because RX MCU pins of these functions are multiplexed. Refer to section 7.4 to select the external SDRAM.

Table 6-7. Overview of the external SDRAM

Specification	Description
Type Name	AS4C8M16SA-7TCN
Constitution	2Meg x 16bit x 4bank
Capacity	128Mbit
Row Address	12bit
Column Address	9bit
Number of banks	4
Row Cycle Time (tRC)	Min. 63ns (same bank)
Initialization Auto Refresh Count	Min. 2
Precharge Command Period (tRP)	Min. 21ns (same bank)
Auto Refresh Request Period	15.625us (64ms / 4096)
CAS Latency (CL)	2 or 3
Write Recovery Period (tWR)	Min. 14ns
Active-to-Precharge Command Period (tRAS)	Min. 42ns (same bank)
Active-to-Read or Write Delay (tRCD)	Min. 21ns (same bank)

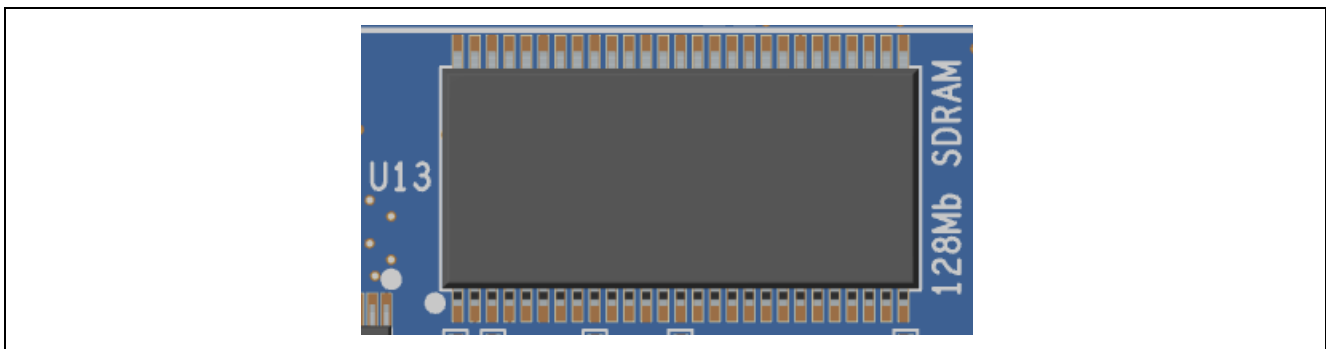


Figure 6-5. External SDRAM

Note: The external SDRAM IC is implemented on MCU Native Pin Access area, however, the external SDRAM is described in section 6 “Special Feature Access Area” because the external SDRAM is functionally categorized into Special Feature Access.

6.4 QSPIX

Included on the EK-RX671 board is a Renesas 64 Mbit SPI Serial Flash Memory (AT25QF641B). The SPI Serial Flash device (U11) connects to the Quad-SPI Memory Interface (QSPIX) on the RX MCU and defaults to standard SPI mode initially. The flash memory is enabled for XIP (Execute-in-place) mode directly after power-on.

The Quad-SPI cannot be configured with the external SDRAM and microSD card simultaneously because RX MCU pins of these functions are multiplexed. Refer to section 7.4 to select the QSPI flash memory.

Table 6-8. Quad-SPI Flash Memory Port Assignments

EK-RX671		RX MCU
Signal	Function	Port
QSSL-B	Chip Select	PD4
QSPCLK-B	Clock	PD5
QIO0-B	Bi-directional Data 0	PD6
QIO1-B	Bi-directional Data 1	PD7
QIO2-B	Bi-directional Data 2	PD2
QIO3-B	Bi-directional Data 3	PD3

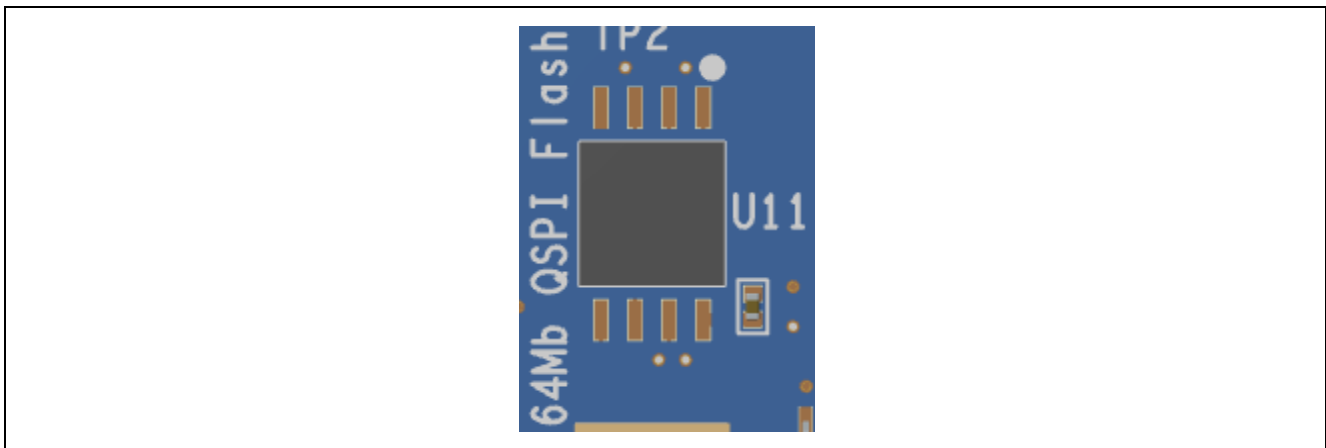


Figure 6-6. Quad-SPI Flash

Note: The QSPI flash memory is implemented on MCU Native Pin Access area, however, the Quad-SPI Flash is described in section 6 “Special Feature Access Area” because the Quad-SPI Flash is functionally categorized into Special Feature Access.

6.5 Touch Interface

The RX MCU incorporates Capacitive Touch Sensing Unit (CTSUa), and the CTSU is connected to 2 touch buttons on the EK-RX671 board.

Table 6-9. Touch Interface

EK-RX671		RX MCU	Configuration	
Signal	Function	Port	Short	Open
TS1	Electrostatic capacitance measurement pin (Touch Button 1)	P33	-	-
TS5	Electrostatic capacitance measurement pin (Touch Button 2)	P24	-	-
TSCAP	LPF (Low-pass filter) connection pin	PC4	-	E44

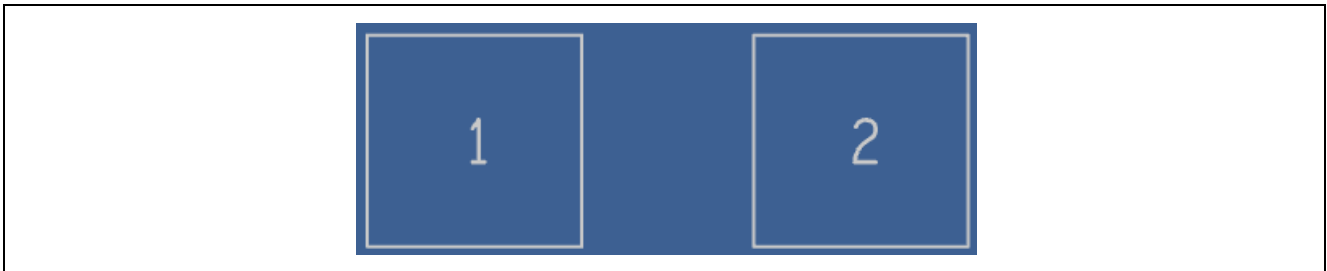


Figure 6-7. Touch Buttons

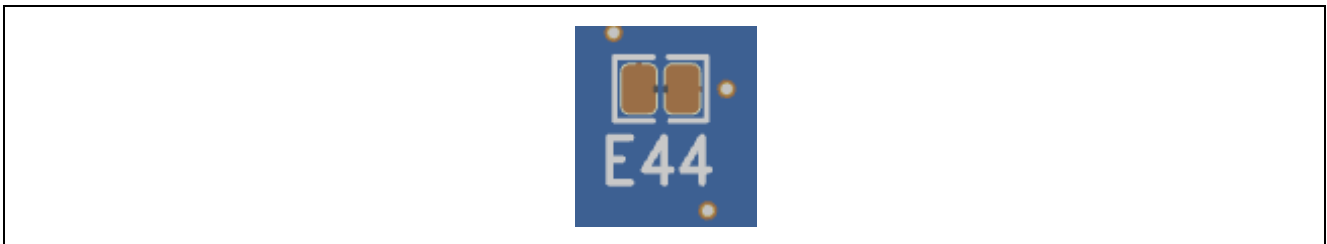


Figure 6-8. Touch Interface Copper Jumpers (bottom side)

Note: Two touch buttons are implemented on MCU Native Pin Access area, however, the Touch Interface is described in section 6 “Special Feature Access Area” because the Touch Interface is functionally categorized into Special Feature Access.

7. MCU Native Pin Access Area

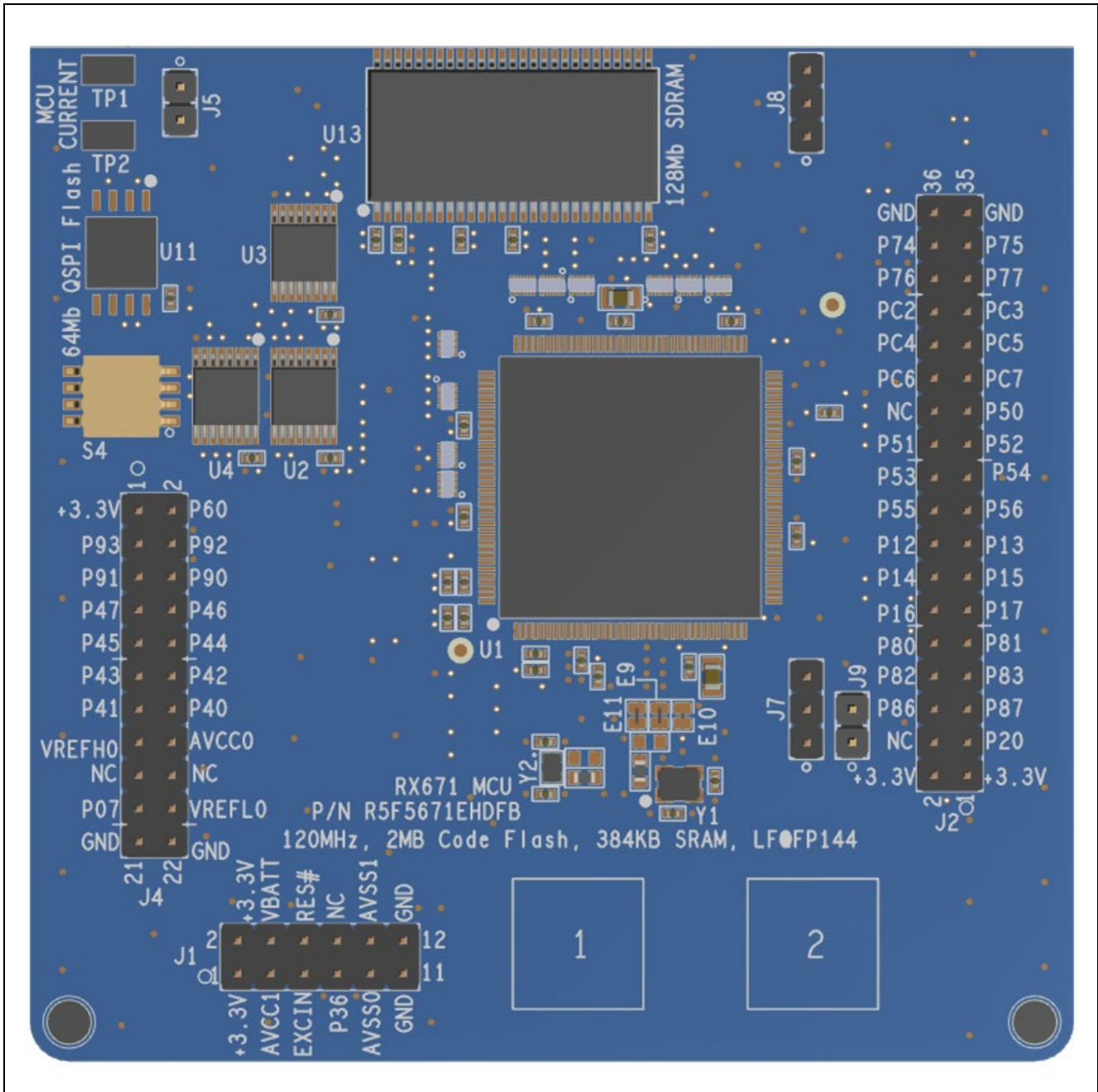


Figure 7-1. Native Pin Access Area

7.1 Breakout Pin Headers

The EK-RX671 board pin headers, J1, J2 and J4, provide access to RX MCU signals. Each header pin is labeled with the voltage or port connected to that pin. Refer to the RX671 Group User's Manual: Hardware for details of each port function, and the EK-RX671 board schematic for pin header port assignments.

The placement of the breakout pin headers allows for a standard 2.54 mm (0.100") center breadboard to be placed on all three pin headers simultaneously. This can be used for prototyping and testing of custom circuitry for use with the RX MCU.

7.2 MCU Current Measurement

Included in the Native Pin Access area are current measurement test points to measure the RX MCU current.

The EK-RX671 board provides 2 test points (TP1 and TP2) for current measurement of the main +3.3 V MCU power. Set an ammeter between TP1 and TP2 without shunt jumpers at J5, and then measure the main +3.3 V MCU power current.

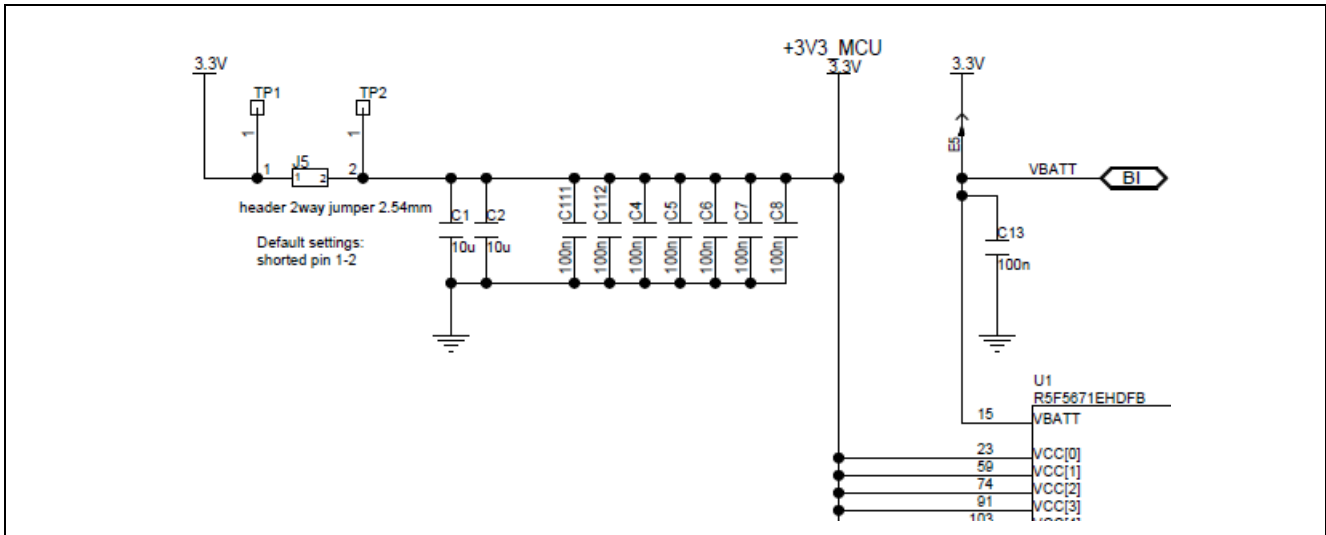


Figure 7-2. RX MCU Current Measurement Circuit

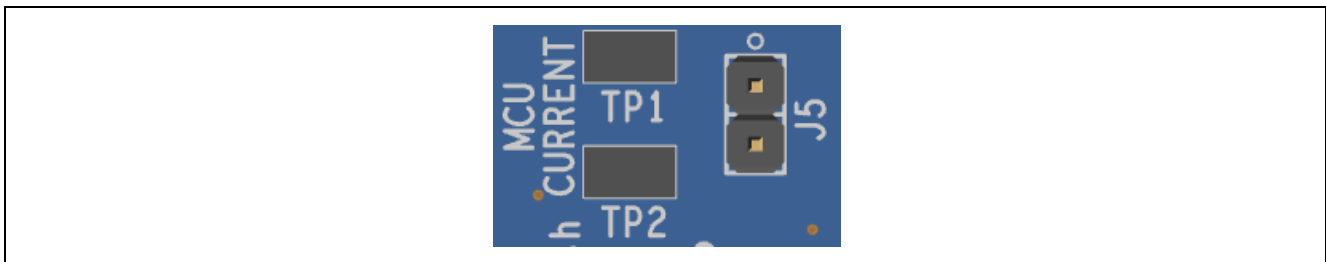


Figure 7-3. Pin Header Jumper J5

7.3 MCU Operating Mode

MCU operating mode is configured by DIP switch (S4) and pin header jumpers (J7, J8 and J9).

Table 7-1. MCU Operating Mode Configuration

S4 Pin1	S4 Pin2	J7	J8	J9	Description
OFF	OFF	Jumper on pins 2-3	Jumper on pins 2-3	Open	Debug on-board mode
OFF	ON	Jumper on pins 2-3	Jumper on pins 2-3	Open	Single Chip mode or Debug in mode
OFF	ON	Jumper on pins 1-2	Jumper on pins 2-3	Open	Single Chip mode or Debug in with hot plug-in mode
ON	ON	Jumper on pins 2-3	Jumper on pins 1-2	Open	USB Boot mode (Bus powered)
ON	ON	Jumper on pins 2-3	Jumper on pins 1-2	Short	USB Boot mode (Self powered)
ON	ON	Jumper on pins 2-3	Jumper on pins 2-3	Open	SCI Boot mode

7.4 Bus Switch

The microSD card, external SDRAM and QSPI flash memory on the EK-RX671 board cannot be used simultaneously because RX MCU pins of these functions are multiplexed. The multiplexed signals are connected to each device through 3 bus switch ICs (U2, U3 and U4). The user must set DIP switch S4 Pin 3 and Pin 4 to select one function.

Table 7-2. DIP Switch Configuration

S4 Pin3	S4 Pin4	Available Function
OFF	OFF	QSPI flash memory
ON	OFF	External SDRAM
OFF	ON	N/A (Do not select)
ON	ON	microSD card

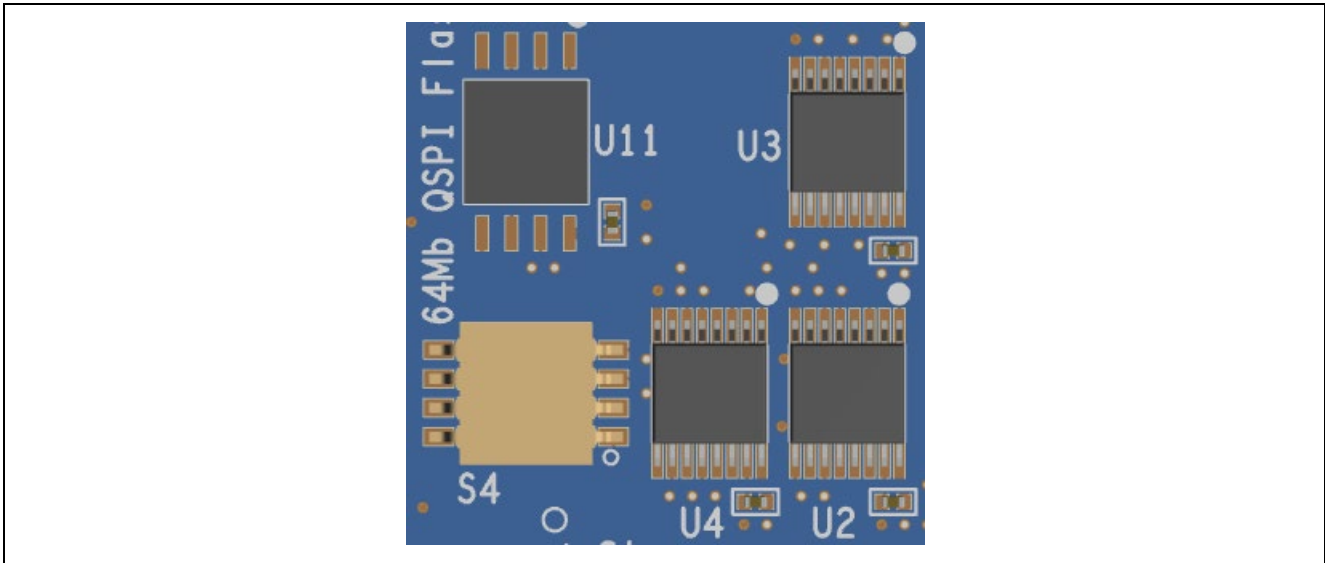


Figure 7-4. DIP switch (S4) and Bus Switch ICs (U2, U3 and U4)

8. Certifications

The EK-RX671 v1 kit meets the following certifications/standards. See page 3 of this user's manual for the disclaimer and precautions.

8.1 EMC/EMI Standards

- FCC Notice (Class A)



This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

NOTE- This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/television technician for help.

- Innovation, Science and Economic Development Canada ICES-003 Compliance:

CAN ICES-3 (A)/NMB-3(A)

- CE Class A (EMC)



This product is herewith confirmed to comply with the requirements set out in the Council Directives on the Approximation of the laws of the Member States relating to Electromagnetic Compatibility Directive 2014/30/EU.

Warning – This is a Class A product. In a domestic environment this product may cause radio interference in which case the user may be required to take adequate measures to correct this interference.

- UKCA Class A (EMC)



This product is in conformity with the following relevant UK Statutory Instrument(s) (and its amendments): 2016 No. 1091 Electromagnetic Compatibility Regulations 2016.

Warning – This is a Class A product. In a domestic environment this product may cause radio interference in which case the user may be required to take adequate measures to correct this interference.

- Taiwan: Chinese National Standard 13438, C6357 compliance, Class A limits
- Australia/New Zealand AS/NZS CISPR 32:2015, Class A

8.2 Material Selection, Waste, Recycling and Disposal Standards

- EU RoHS
- China SJ/T 113642014, 10-year environmental protection use period.

8.3 Safety Standards

- UL 94V-0

9. Design and Manufacturing Information

The design and manufacturing information for the EK-RX671 v1 kit is available in the “EK-RX671v1 Design Package” available on renesas.com/rx/ek-rx671.

- Design package file name: ek-rx671-v1-designpackage.zip
- Design package contents

Table 9-1. EK-RX671 v1 Board Design Package Contents

File Type	Content	File/Folder Name
File (PDF)	Schematics	ek-rx671-v1-schematics
File (PDF)	Mechanical Drawing	ek-rx671-v1-mechdwg
File (PDF)	3D Drawing	ek-rx671-v1-3d
File (PDF)	BOM	ek-rx671-v1-bom
Folder	Manufacturing Files	Manufacturing Files
Folder	Design Files	Design Files-Cadence Allegro

10. Website and Support

Visit the following URLs to learn about the kit and the RX family of microcontrollers, download tools and documentation, and get support.

EK-RX671 Resources	renesas.com/rx/ek-rx671
RX Product Information	renesas.com/rx
RX Product Support Forum	renesas.com/rx/forum
Renesas Support	renesas.com/support

Provide Feedback/Request a Feature

Renesas aims to provide the best microcontroller kit experience to help our customers jumpstart innovation and take products to market faster with the RX family of microcontrollers. The Renesas RX microcontroller kits have been designed with a lot of attention to detail and customer-centered thinking in every aspect of the design. Renesas aims to exceed customer expectation.

Renesas looks forward to hearing your feedback and learning how we can enhance your experience. Please share your feedback at renesas.com/rx/kitfeedback.

Revision History

Rev.	Date	Description	
		Page	Summary
1.00	Jan.31.23	—	Initial release

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