

RX74M Group

Evaluation Kit for RX74M Microcontroller Group
EK-RX74M v1
User's Manual

Renesas RX Family
RX700 Series

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(Rev.5.0-1 October 2020)

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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

EK-RX74M v1 User's Manual**Contents**

1. Kit Overview	5
1.1 Assumptions and Advisory Notes	9
2. Kit Contents	9
3. Ordering Information	9
4. Hardware Architecture and Default Configuration	10
4.1 Kit Architecture	10
4.2 System Block Diagram	12
4.3 Component Placement Location and Dimension	13
4.4 Jumper Settings	16
4.4.1 Copper Jumpers	16
4.4.2 Traditional Pin Header Jumpers	16
4.4.3 Default Jumper and DIP SW Configuration	16
5. System Control and Ecosystem Access Area	21
5.1 Power	22
5.1.1 USB DEBUG1	22
5.1.2 USB HIGH-SPEED	22
5.1.3 USB FULL-SPEED	22
5.1.4 USB SERIAL	22
5.1.5 External DC Power Supply	22
5.1.6 Power Supply Considerations	23
5.1.7 Power-up Behavior	23
5.2 Debug	24
5.2.1 Debug On-Board	25
5.2.2 Debug in	26
5.3 Ecosystem	27
5.3.1 Seeed Grove Connectors	27
5.3.2 SparkFun Qwiic Connector	29
5.3.3 Digilent Pmod Connectors	30
5.3.4 Arduino Connector	34
5.3.5 MikroElektronika mikroBUS Connector	37
5.4 Connectivity	39
5.4.1 USB to Serial	39
5.4.2 USB Full-Speed	41

5.5	Miscellaneous	44
5.5.1	LED	44
5.5.2	User and Reset Switches	45
5.5.3	Debug mode and MCU boot mode	46
6.	Special Feature Access Area	47
6.1	CAN FD (Controller Area Network with Flexible Data Rate)	47
6.2	Δ - Σ Modulator Interface (DSMIF)	49
6.3	Ethernet System	51
6.4	OctaFlash	59
6.4.1	OctaFlash Read / Write Byte Order	60
6.5	OctaRAM	61
6.6	RS-485	63
6.7	SD/MMC Host Interface (SDHI)	64
6.8	USB High-Speed	66
7.	MCU Native Pin Access Area	68
7.1	Breakout Pin Headers	68
7.2	MCU and USB Current Measurement	69
8.	Recommended Components	71
9.	Certifications	72
9.1	EMC/EMI Standards	72
9.2	Material Selection, Waste, Recycling and Disposal Standards	73
9.3	Safety Standards	73
10.	Design and Manufacturing Information	74
11.	Website and Support	74
	Revision History	75

List of Abbreviations and Acronyms

Table 1. List of Abbreviations and Acronyms

ADC	Analog to Digital Converter
BoM	Bill of Materials
bps	Bits Per Second
CAN	Controller Area Network
CAN FD	CAN with Flexible Data Rate
CS	Chip Select
CTS	Clear to Send
DSMIF	Δ - Σ (Delta-Sigma) Modulator Interface
E2 OB	E2 emulator On Board
EK	Evaluation Kit
EMC	Electro Magnetic Compatibility
EMI	Electro Magnetic Interference
ESC	EtherCAT Slave Controller
ESWM	Layer 3 Ethernet Switch Module
EU	European Union
FIT	Firmware Integration Technology
GMII	Gigabit Media-Independent Interface
GPIO	General Purpose Input Output
GPTW	General-Purpose PWM Timer
I ² C (or IIC)	Inter-Integrated Circuit
I3C	Improved Inter Integrated Circuit
IDE	Integrated Development Environment
INT	Interrupt
I/O	Input/Output
IRQ	Interrupt Request
JTAG	Joint Test Action Group
LED	Light Emitting Diode
LFBGA	Low profile Fine-pitch Ball Grid Array Package
MCU	Micro Controller Unit
MII	Media Independent Interface
MISO	Master In Slave Out
MMC	Multi Media Card
MOSI	Master Out Slave In
MRAM	Magnetoresistive Random Access Memory
NC (or N.C.)	Not Connected
PWM	Pulse Width Modulation
RI3C	Renesas I3C
RIIC	Renesas I ² C
RMII	Reduced Media Independent Interface
RSCI	Renesas SCI
RSPI	Renesas SPI
RTC	Real Time Clock
RTS	Request to Send
RXD	Receive Data

SCI	Serial Communications Interface
SCK	Serial Clock
SCL	Serial Clock Line
SDA	Serial Data Line
SMT	Surface Mount Technology
SPI	Serial Peripheral Interface
SWD	Serial Wire Debug
TP	Test Point
TXD	Transmit Data
UART	Universal Asynchronous Receiver Transmitter
USB	Universal Serial Bus
USB FS	USB Full-Speed
USB HS	USB High-Speed
XSPI	eXpanded SPI

1. Kit Overview

The EK-RX74M v1, an Evaluation Kit for RX74M MCU Group, enables users to seamlessly evaluate the features of the RX74M MCU group and develop embedded systems applications using Flexible Software Package (FSP) 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-RX74M v1 are categorized in three groups (consistent with the architecture of the kit) as follows:

MCU Native Pin Access

- R5K574MCB4AE ^{*1} MCU (referred to as RX MCU)
 - 600 MHz, 32 bit RX CPU (RXv3e)
 - 1 MB Code MRAM, 1.5 MB RAM
 - 320 pin, LFBGA package
- Native pin access through 20 x 2-pin x 3-piece male headers
- MCU and MCU's USB module current measurement points for current consumption measurement
- Providing 24.000 MHz crystal oscillator as main clock
- Providing 32.768 kHz crystal oscillator as sub clock

Special Feature Access

- CAN FD
- RS-485 (The connector is not fitted.)
- Ethernet (2 ports, MII / GMII / RMII) or EtherCAT
- Δ - Σ Modulator Interface (DSMIF) (The connectors are not fitted.) ^{*2}
- RX74M USB High-speed host and function
- microSD card slot for SDHI
- 256 Mbit External OctalRAM ^{*2}
- 512 Mbit External OctaFlash ^{*2}

System Control and Ecosystem Access

- Five 5 V input sources
 - USB (USB DEBUG1, USB HS, USB FS, USB SERIAL)
 - External power supply (using surface mount clamp test points and power input vias)
- Two Debug modes
 - On-board debugger / programmer (E2 emulator On Board (referred as E2 OB, FINE Interface))
 - Debug in (JTAG / SWD / FINE Interface)
- 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 popular ecosystems expansions
 - Two Seeed Grove system (I²C / Analog) connectors (not fitted)
 - SparkFun Qwiic connector (not fitted)
 - Two Digilent Pmod (UART / SPI / I²C) connectors
 - Arduino Uno R3 (referred to as Arduino) connector
 - MikroElektronika mikroBUS connector
- USB serial converter
- RX74M USB Full-speed host and function ^{*3}

- *1. R5K574MCB4AE has a built in encryption module.
- *2. The DSMIF, OctalRAM and OctaFlash are among the Special Feature Access features. Normally, it would be in the Special Feature Access area, however, to optimize the layout, routing, and performance, it is placed in the MCU Native Pin Access area.
- *3. The USB Full-speed is among the System Control and Ecosystem Access features. Normally, it would be in the System Control and Ecosystem Access area, however, to optimize the layout, routing, and performance, it is placed in the Special Feature Access area.

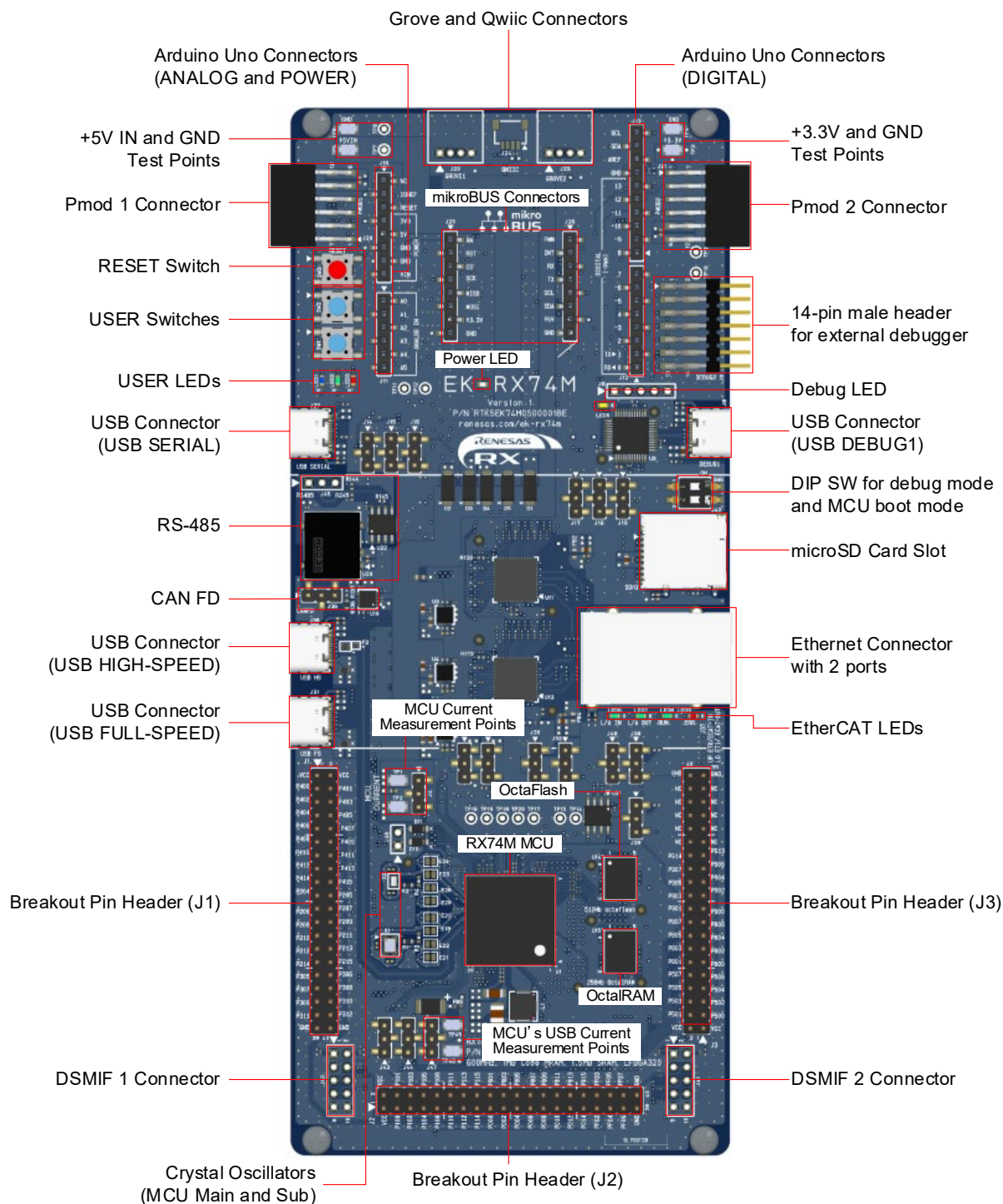


Figure 1. EK-RX74M v1 Top Side

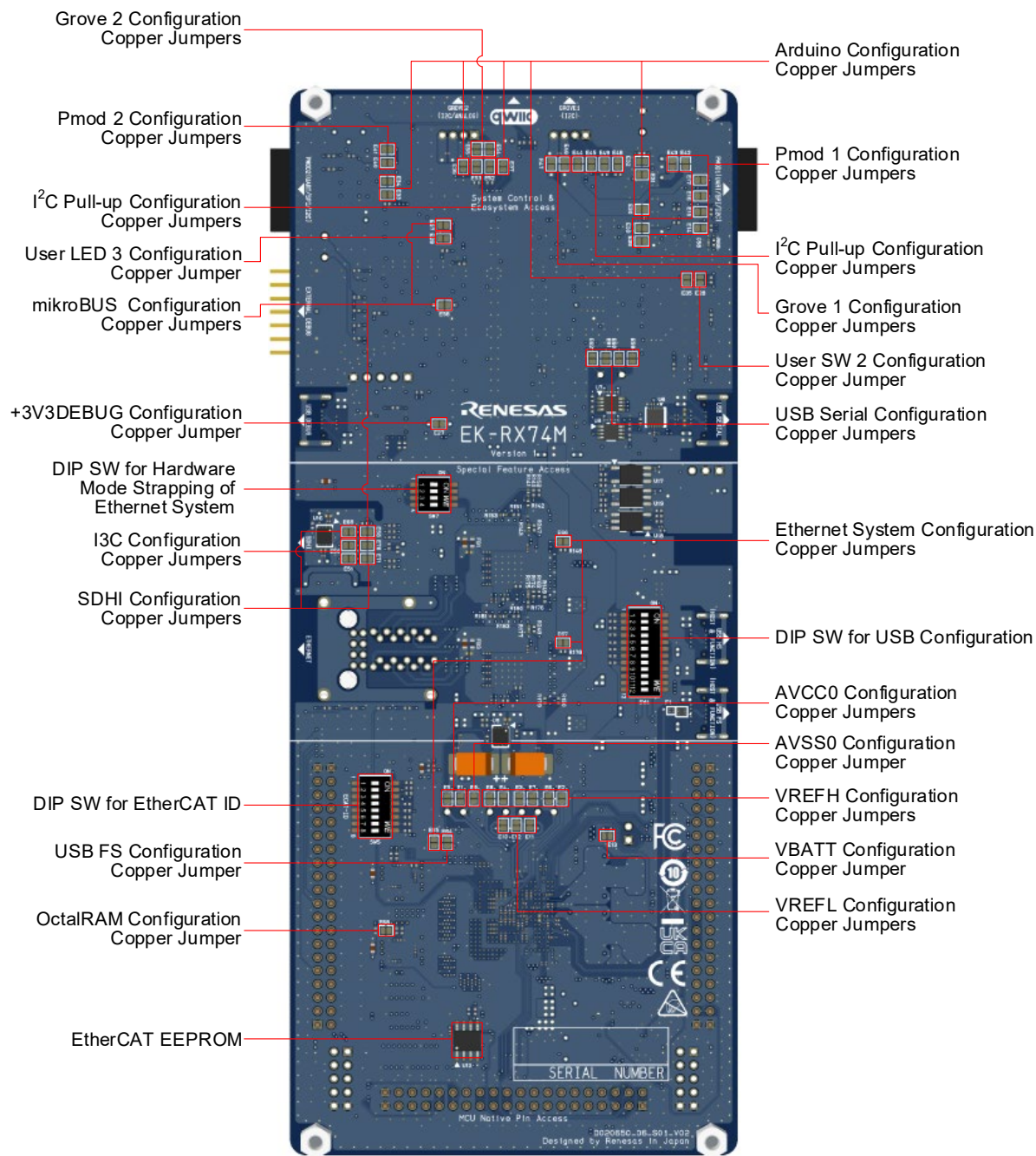


Figure 2. EK-RX74M v1 Bottom Side

1.1 Assumptions and Advisory Notes

- It is assumed that the user has basic understanding of microcontrollers and embedded systems hardware.
- It is recommended that the user refers to the EK-RX74M Quick Start Guide to get acquainted with the kit and the Quick Start Example Project that EK-RX74M v1 comes pre-programmed with.
- Flexible Software Package (FSP) and Integrated Development Environment (IDE) such as e² studio are required to develop embedded applications on EK-RX74M v1 kit.
- Instructions to download and install software, import example projects, build them and program the EK-RX74M v1 are provided in the Quick Start Guide.

2. Kit Contents

The kit includes the following component:

- EK-RX74M x 1

3. Ordering Information

- EK-RX74M v1 orderable part number: RTK5EK74M0S00001BE

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

4. Hardware Architecture and Default Configuration

4.1 Kit Architecture

The EK-RX74M v1 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 2. Kit Architecture

Kit area	Area features	Area present on all similar kits	Functionality
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	MCU special features: CAN FD, RS-485, Ethernet / EtherCAT, DSMIF, USB High-Speed Host and Function, microSD card slot, OctalRAM, OctaFlash	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, debug mode and MCU boot mode configuration ^{*1}	Yes	Same or similar across similar kits

^{*1}. The debug mode and MCU boot mode are configured by 2-pole DIP SW (SW6) (Refer to section [5.5.3](#)). These modes are among the System Control and Ecosystem Access features. Normally, it would be in System Control and Ecosystem Access area, however, to optimize the layout, routing, and performance, it is placed in the Special Feature Access area.

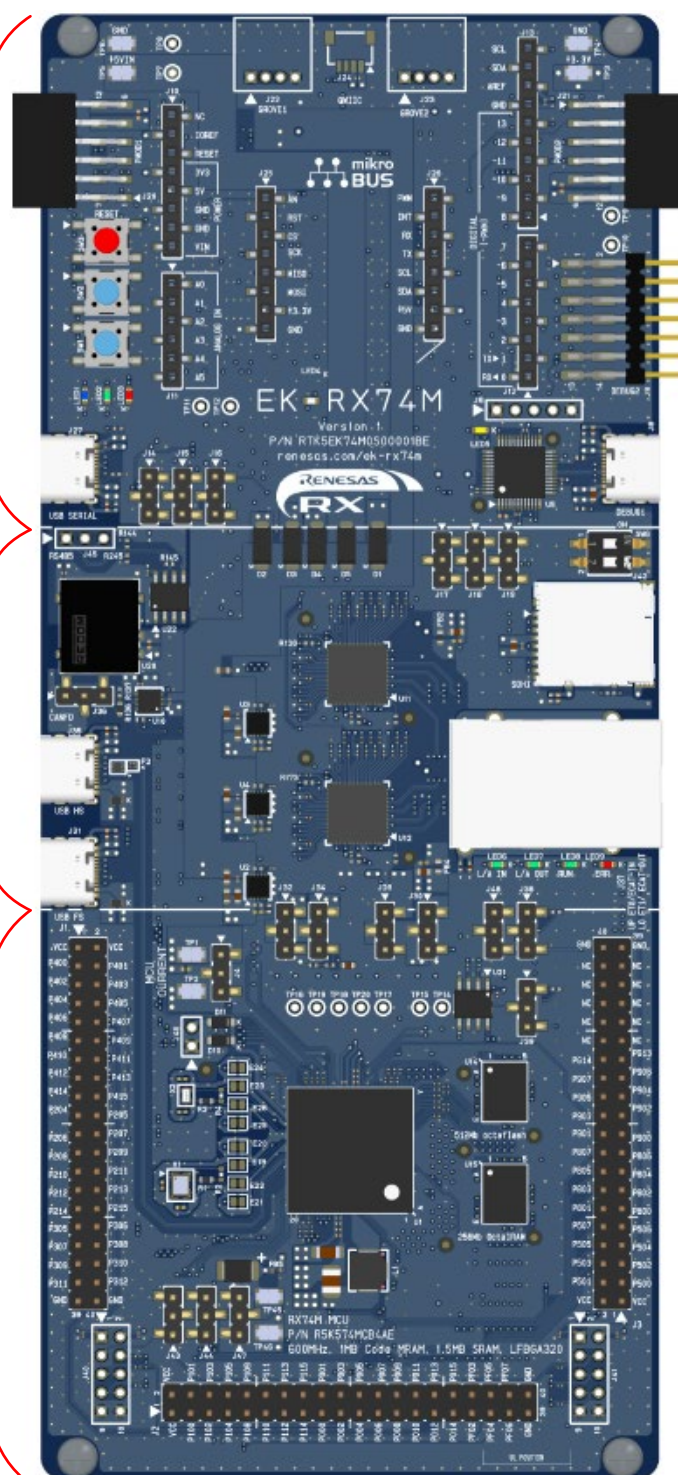


Figure 3. EK-RX74M v1 Area Definitions

4.2 System Block Diagram

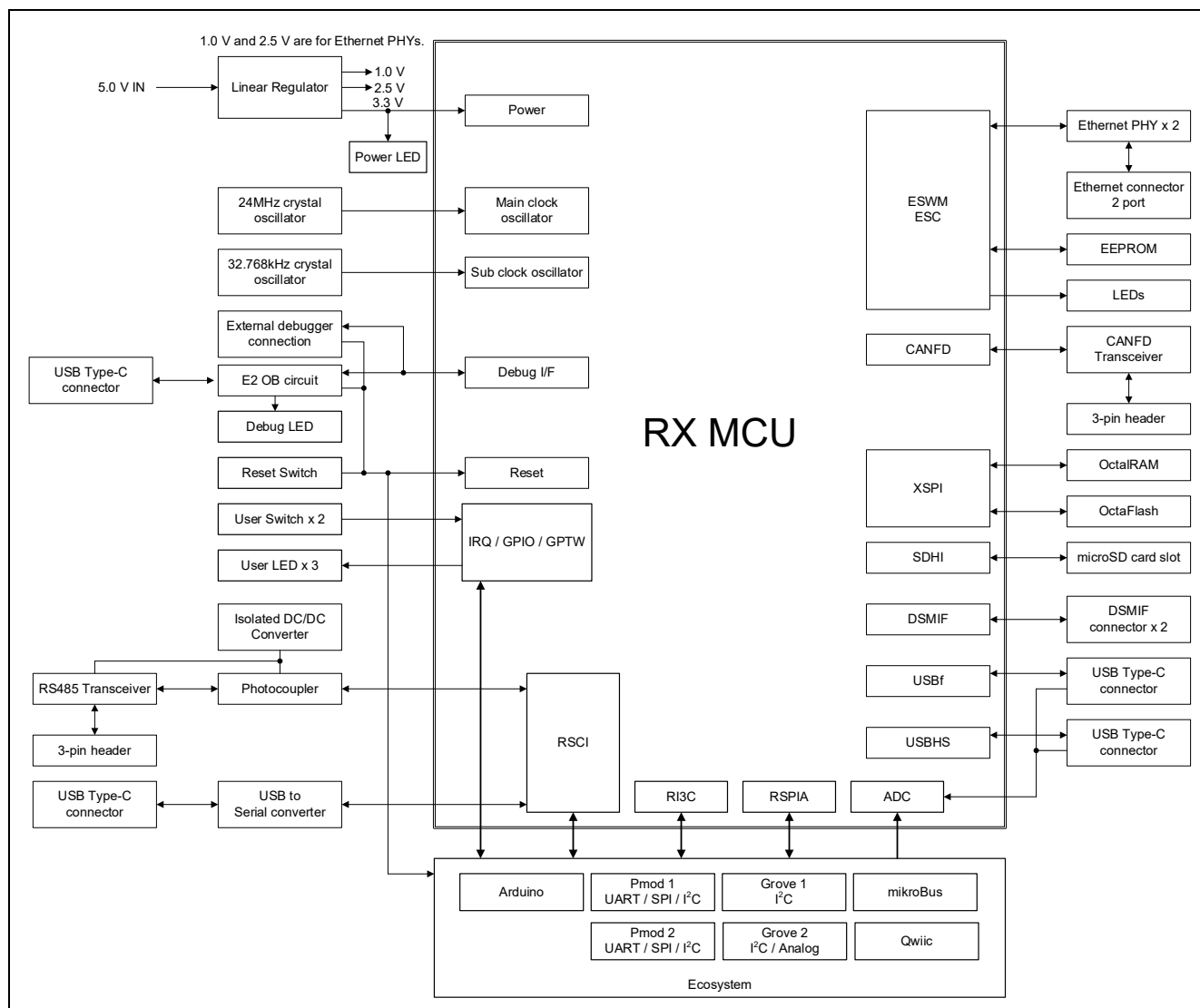


Figure 4. EK-RX74M v1 Block Diagram

4.3 Component Placement Location and Dimension

Reference number for components on the EK-RX74M v1 is shown below.

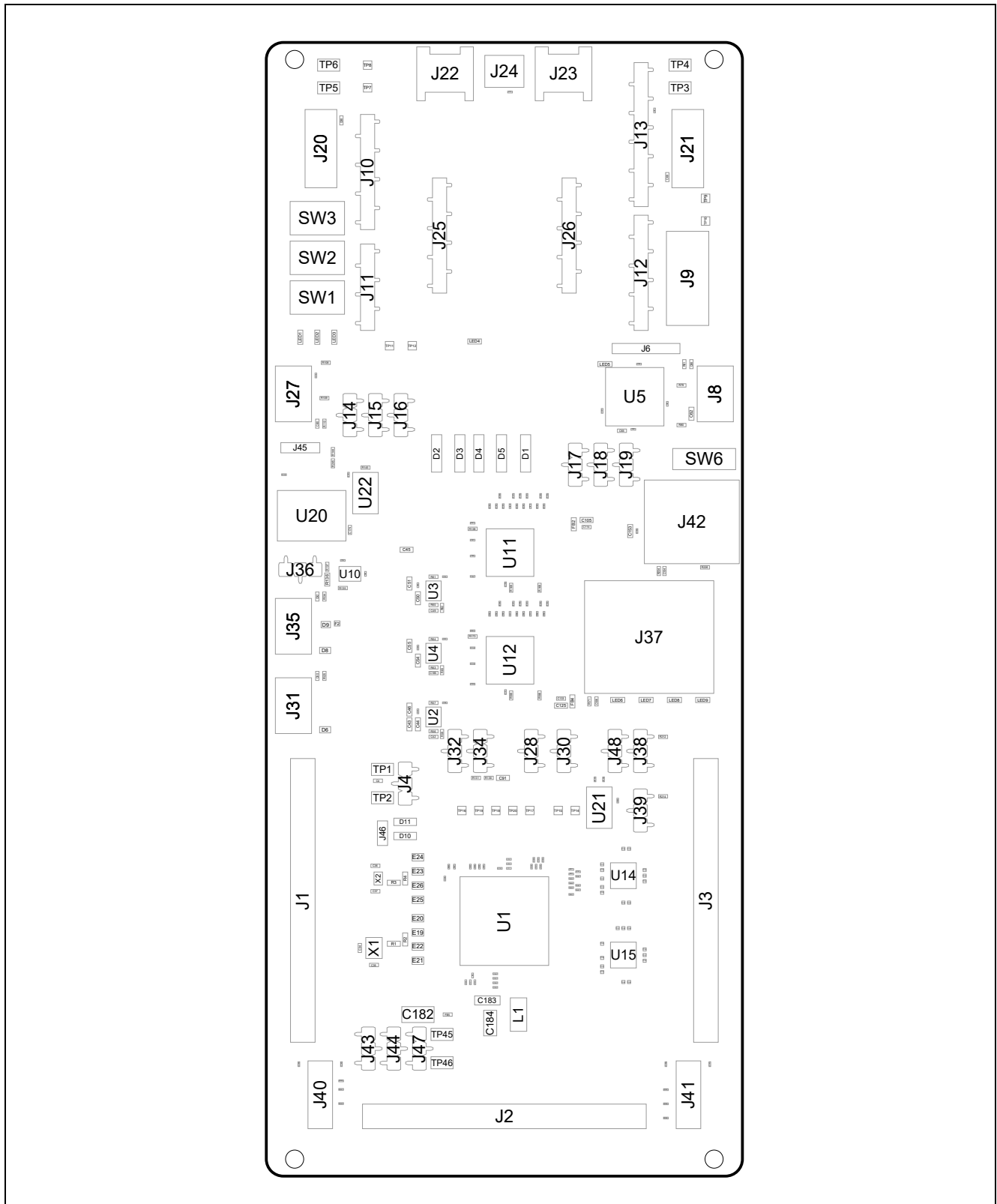
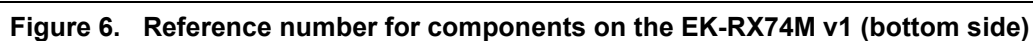


Figure 5. Reference number for components on the EK-RX74M v1 (top side)



Dimensions of the EK-RX74M v1 are shown below in mm.

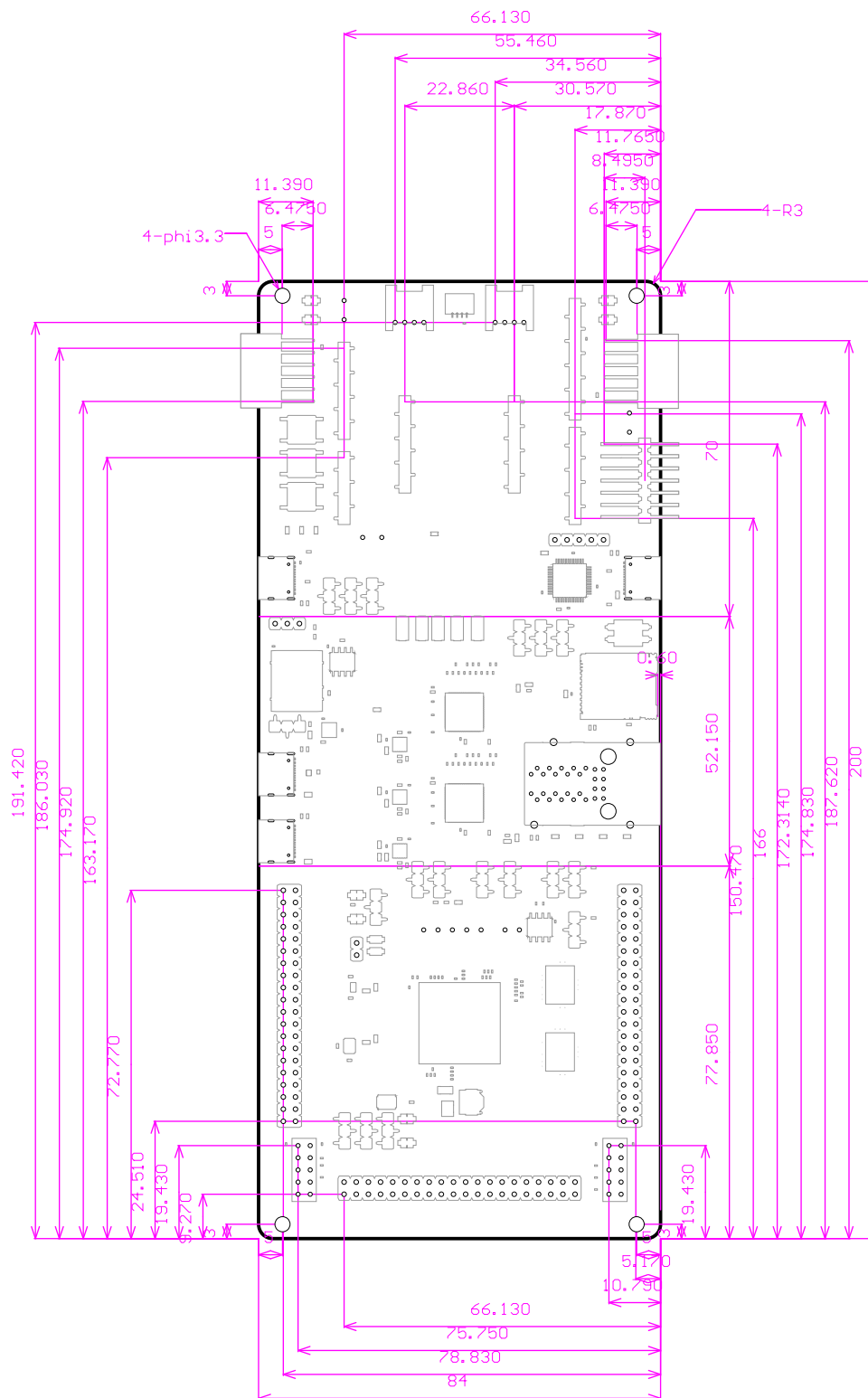


Figure 7. Dimensions of the EK-RX74M v1

4.4 Jumper Settings

Two types of jumpers are provided on the EK-RX74M v1.

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

The following sections describe each type and their default configuration.

4.4.1 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 0Ω SMD resistor may be placed across the two pads to short the pads together by soldering.

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).

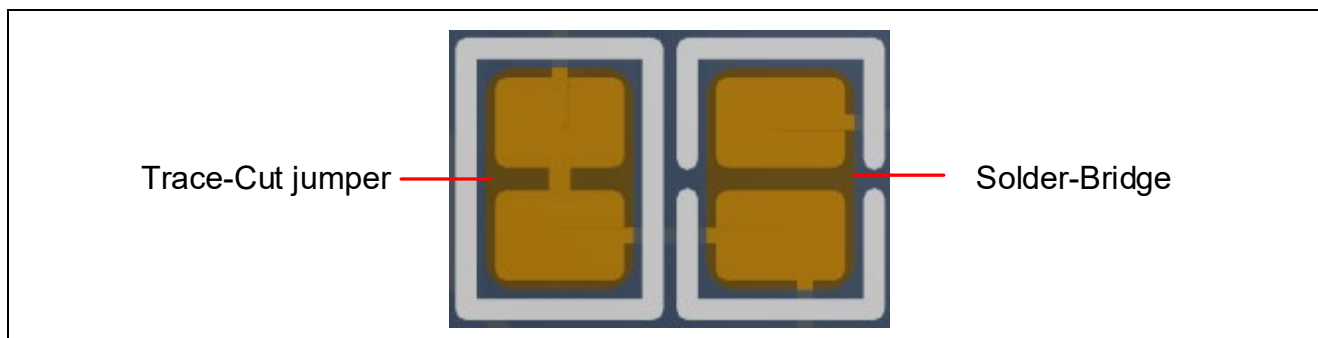


Figure 8. Copper Jumpers

4.4.2 Traditional Pin Header Jumpers

These jumpers are traditional small pitch jumpers that require an external shunt to close them. The traditional pin header jumpers on the EX-RX74M v1 are 0.1" (2.54 mm) pitch headers and use compatible 2.54 mm shunt jumpers.

4.4.3 Default Jumper and DIP SW Configuration

The following table describes the default settings for each jumper on the EK-RX74M v1. This includes copper jumpers (reference number Ex), traditional pin header jumpers (reference number Jx) and DIP SW (reference number SWx).

Function for copper jumper Ex in the table describe function at Closed. The circuit group for each jumper and DIP SW is the reference number found in the board schematic (available in the Design Package). Functional details for many of the listed jumpers may be found in sections associated with each functional area of the kits.

Table 3. Default Jumper and DIP SW Settings

Location	Circuit Group	Default	Function
J4	RX74M MCU_1	Jumper on pins 1-2	RX MCU Current Measurement (+3V3_MCU)
J14	Pmod 1	Jumper on pins 2-3	Connect P202 (SD0_DAT0-C / SCL00-B) to J20-Pin3 (RXD / MISO / SCL)
J15	Pmod 1	Jumper on pins 2-3	Connect P203 (SD0_DAT1-C / SDA00-B) to J20-Pin4 (RTS / SCK / SDA)
J16	Pmod 1	Jumper on pins 2-3	
J17	Pmod 2	Jumper on pins 2-3	Connect P904 (TXD006-B / SMOSI006-B / SSDA006) to J21-Pin2 (TXD / MOSI)
J18	Pmod 2	Jumper on pins 2-3	Connect P907 (RTS006#) to J21-Pin4 (RTS / SCK / SDA)
J19	Pmod 2	Jumper on pins 1-2	
J28	USB FS	Open	USB FS operating mode. Function (Self-power) mode is configured at shipping. (Refer to Table 20)
J30	USB FS	Jumper on pins 2-3	
J32	USB HS	Open	USB HS operating mode. Function (Self-power) mode is configured at shipping. (Refer to Table 44)
J34	USB HS	Jumper on pins 2-3	
J38	EtherCAT-LEDs	Jumper on pins 1-2	Connect PC06 (ET0_TX_ER-A / CATLINKACT0) to U11-Pin35 (TX_ER)
J39	EtherCAT-LEDs	Jumper on pins 1-2	Connect to PA07 (ET1_TX_ER-A / CATLINKACT1) to U12-Pin35 (TX_ER)
J43	ET0_ECATA0	Jumper on pins 1-2	Connect P000 (DSM0_CLK0-B / CATRESTOUT) to J40-Pin3
J44	ET0_ECATA0	Jumper on pins 1-2	Connect P413 to U11-Pin53 (NRESET#) and U12-Pin53 (NRESET#)
J47	RX74M MCU_3	Jumper on pins 1-2	USB module Current Measurement (+3V3_MCU_USB)
J48	USB FS	Jumper on pins 1-2	Connect P205 (USBHS_VBUSEN / SD0_CD) to U9-Pin3 (EN1)
E1	RX74M MCU_1	Closed	Connect AVCC0 to 3.3V
E2	RX74M MCU_1	Closed	Connect VREFH00 to 3.3V
E3	RX74M MCU_1	Closed	Connect VREFH01 to 3.3V
E4	RX74M MCU_1	Closed	Connect VREFH02 to 3.3V
E5	RX74M MCU_1	Open	Connect AVCC0 to +3V3_MCU
E6	RX74M MCU_1	Open	Connect VREFH00 to +3V3_MCU
E7	RX74M MCU_1	Open	Connect VREFH01 to +3V3_MCU
E8	RX74M MCU_1	Open	Connect VREFH02 to +3V3_MCU
E9	RX74M MCU_1	Closed	Connect AVSS0 to GND
E10	RX74M MCU_1	Closed	Connect VREFL02 to GND
E11	RX74M MCU_1	Closed	Connect VREFL01 to GND
E12	RX74M MCU_1	Closed	Connect VREFL00 to GND
E13	RX74M MCU_1	Closed	Connect VBATT to +3V3_MCU
E14	Pmod 1	Closed	Connect P007 (IRQ23-DS) to J20-Pin7 (INT)
E15	Pmod 1	Closed	Connect PG14 to J20-Pin8 (RESET)
E16	Pmod 1	Closed	Connect PG13 to J20-Pin9 (GPIO)
E17	Pmod 1	Closed	Connect P111 to J20-Pin10 (GPIO)
E19	RX74M MCU_2	Closed	Connect P306 (EXTAL) to crystal oscillator X1
E20	RX74M MCU_2	Open	Connect P306 (EXTAL) to J1-Pin32
E21	RX74M MCU_2	Open	Connect P307 (XTAL) to J1-Pin33

Location	Circuit Group	Default	Function
E22	RX74M MCU_2	Closed	Connect P307 (XTAL) to crystal oscillator X1
E23	RX74M MCU_2	Closed	Connect P309 (XCIN) to crystal oscillator X2
E24	RX74M MCU_2	Open	Connect P309 (XCIN) to J1-Pin35
E25	RX74M MCU_2	Open	Connect P308 (XCOUT) to J1-Pin34
E26	RX74M MCU_2	Closed	Connect P308 (XCOUT) to crystal oscillator X2
E27	Power Supply	Closed	Connect 3.3V to +3V3DEBUG (Do not open copper jumper E27)
E28	User Switches	Closed	Connect P109 (IRQ17) to user switch SW2
E29	User LEDs	Closed	Connect P604 (GTIOC6A) to user LED3
E30	Arduino Uno	Open	Connect 5.0V to J10-Pin5 (5V)
E31	Arduino Uno	Closed	Connect RES# to J10-Pin3 (RESET)
E32	Arduino Uno	Open	Connect P008 (IRQ24) to J10-Pin3 (RESET)
E33	Arduino Uno	Closed	Connect P507 (SSL20-B / GTIOC5B) to J13-Pin3 (D10 / SS / PWM)
E34	Arduino Uno	Open	Connect P806 (GTIOC14A) to J13-Pin3 (D10 / SS / PWM)
E35	Arduino Uno	Closed	Connect P109 (IRQ17) to J12-Pin3 (D2 / INT)
E36	Arduino Uno	Closed	Connect P901 (TXD001-C / SDA001 / AN033) to J12-Pin2 (D1 / TX)
E37	Arduino Uno	Closed	Connect P900 (RXD001-C / SSCL001 / AN032) to J12-Pin1 (D0 / RX)
E38	Pmod 1	Closed	Connect P009 (IRQ25) to J20-Pin1 (CTS / CS / INT)
E39	Pmod 1	Open	Connect P212 (CTS005# / SCK005-C / IRQ28) to J20-Pin1 (CTS / CS / INT)
E40	Pmod 2	Closed	Connect P902 (IRQ10) to J21-Pin1 (CTS / CS / INT)
E41	Pmod 2	Open	Connect P903 (CTS006# / IRQ11) to J21-Pin1 (CTS / CS / INT)
E42	Pmod 1	Open	Connect 5.0V to J20-Pin6 and J20-Pin12
E43	Pmod 1	Closed	Connect 3.3V to J20-Pin6 and J20-Pin12
E44	Grove 1	Open	Connect P202 (SD0_DAT0-C / SCL00-B) and P203 (SD0_DAT1-C / SDA00-B) to 5.0V (Pull-up)
E45	Grove 1	Closed	Connect P202 (SD0_DAT0-C / SCL00-B) and P203 (SD0_DAT1-C / SDA00-B) to 3.3V (Pull-up)
E46	Grove 1	Open	Connect 5.0V to J22-Pin3(VCC)
E47	Grove 1	Closed	Connect 3.3V to J22-Pin3(VCC)
E48	Grove 1	Closed	Connect P202 (SD0_DAT0-C / SCL00-B) to pull-up power
E49	Grove 1	Closed	Connect P203 (SD0_DAT1-C / SDA00-B) to pull-up power
E50	Grove 1	Closed	Connect P202 (SD0_DAT0-C / SCL00-B) to J14-Pin3 and J22-Pin1 (SCL)
E51	Grove 1	Closed	Connect P203 (SD0_DAT1-C / SDA00-B) to J16-Pin3 and J22-Pin2 (SDA)
E52	Grove 2	Closed	Connect P900 (RXD001-C / SSCL001 / AN032) to pull-up power (3.3V)

Location	Circuit Group	Default	Function
E53	Grove 2	Closed	Connect P901 (TXD001-C / SSDA001 / AN033) to pull-up power (3.3V)
E54	Grove 2	Open	Connect P900 (RXD001-C / SSCL001 / AN032) to J23-Pin1(SCL / AN)
E55	Grove 2	Open	Connect P901 (TXD001-C / SSDA001 / AN033) to J23-Pin2 (SDA / AN)
E56	mikroBUS	Open	Connect 5.0V to J26-Pin7 (+5V)
E57	mikroBUS	Closed	Connect P604 (GTIOC6A) to J26-Pin1 (PWM)
E58	mikroBUS	Open	Connect P501 (IRQ1) to J26-Pin2 (INT)
E59	USB to Serial	Open	Connect P302 (TXD001-A / TDO) to U6-Pin10 (RXD) through U7 (Level shift IC)
E60	USB to Serial	Closed	Connect P114 (TXD012-B) to U6-Pin10 (RXD) through U7 (Level shift IC)
E61	USB to Serial	Open	Connect P303 (RXD001-A / TDI) to U6-Pin7 (TXD) through U8(Level shift IC)
E62	USB to Serial	Closed	Connect P115 (RXD012-B) to U6-Pin7 (TXD) through U8 (Level shift IC)
E64	USB FS	Open	Connect P304 (ETHPHYCLK / USB0_VBUSEN) to U9-Pin4 (EN2)
E65	ET0_ECATA0	Closed	Connect P304 (ETHPHYCLK / USB0_VBUSEN) to U11-Pin63 (XTAL1) and U12-Pin63 (XTAL1) through U21 (Clock buffer)
E66	ET0_ECATA0	Closed	Connect PC00 (ET0_TX_CLK-A / CAT0_TX_CLK-A) to pull-up power (3.3V)
E67	ET1_ECATA1	Closed	Connect PA02 (ET1_TX_CLK-A / CAT1_TX_CLK-A) to pull-up power (3.3V)
E68	OctalRAM	Open	Connect PF09 (XSPI1_INT0# / XSPI1_ECS0#) to U15-Pin A5(RFU) (Do not close copper jumper E68)
E69	SDHI	Closed	Connect P501 (IRQ1) to U16-Pin8 (FLT1#)
E70	SDHI	Open	Connect P202 (SD0_DAT0-C / SCL00-B) to J42-Pin7(DAT0)
E71	SDHI	Open	Connect P203 (SD0_DAT1-C / SDA00-B) to J42-Pin8(DAT1)
SW4-Pin1	USB FS, USB HS	OFF	USB HS CC1 setting. Connect to the pull down resistor at shipping. (Refer to Table 44)
SW4-Pin2	USB FS, USB HS	ON	
SW4-Pin3	USB FS, USB HS	OFF	USB HS CC2 setting. Connect to the pull down resistor at shipping. (Refer to Table 44)
SW4-Pin4	USB FS, USB HS	ON	
SW4-Pin5	USB FS, USB HS	OFF	USB FS CC1 setting. Connect to the pull down resistor at shipping. (Refer to Table 20)
SW4-Pin6	USB FS, USB HS	ON	
SW4-Pin7	USB FS, USB HS	OFF	USB FS CC2 setting. Connect to the pull down resistor at shipping. (Refer to Table 20)
SW4-Pin8	USB FS, USB HS	ON	
SW4-Pin9	USB FS, USB HS	OFF	USB HS CC1 and RX MCU P410 (AN010) connection setting. Not connected at shipping. (Refer to Table 44)
SW4-Pin10	USB FS, USB HS	OFF	USB HS CC2 and RX MCU P411 (AN011) connection setting. Not connected at shipping. (Refer to Table 44)

Location	Circuit Group	Default	Function
SW4-Pin11	USB FS, USB HS	OFF	USB FS CC1 and RX MCU P408 (AN008) connection setting. Not connected at shipping. (Refer to Table 20)
SW4-Pin12	USB FS, USB HS	OFF	USB FS CC2 and RX MCU P409 (AN009) connection setting. Not connected at shipping. (Refer to Table 20)
SW5-Pin1 to Pin8	EtherCAT-ID	All OFF	EtherCAT-ID High/Low level setting. High level setting is at shipping. (Refer to Table 35)
SW6-Pin1	Debug mode and MCU boot mode	ON	RX MCU mode setting. Set RX MCU to Standalone Operation mode or Debug in mode at shipping. (Refer to section 5.2.2 regarding Debug in mode)
SW6-Pin2	Debug mode and MCU boot mode	OFF	
SW7-Pin1	ET0_ECATA0, ET1_ECATA1	OFF	PHY IC (U11) strap option setting. PHY IC RX_DV/RX_CTL pin are set to Low at shipping. (Refer to Table 30)
SW7-Pin2	ET0_ECATA0, ET1_ECATA1	OFF	PHY IC (U11) strap option setting. PHY IC RXD3 pin are set to Low at shipping. (Refer to Table 30)
SW7-Pin3	ET0_ECATA0, ET1_ECATA1	OFF	PHY IC (U12) strap option setting. PHY IC RX_DV/RX_CTL pin are set to Low at shipping. (Refer to Table 30)
SW7-Pin4	ET0_ECATA0, ET1_ECATA1	OFF	PHY IC (U12) strap option setting. PHY IC RXD3 pin are set to Low at shipping. (Refer to Table 30)

5. System Control and Ecosystem Access Area

The following figure shows the System Control and Ecosystem Access area on the EK-RX74M v1. Subsequent sections describe the features and functionality provided in the area.

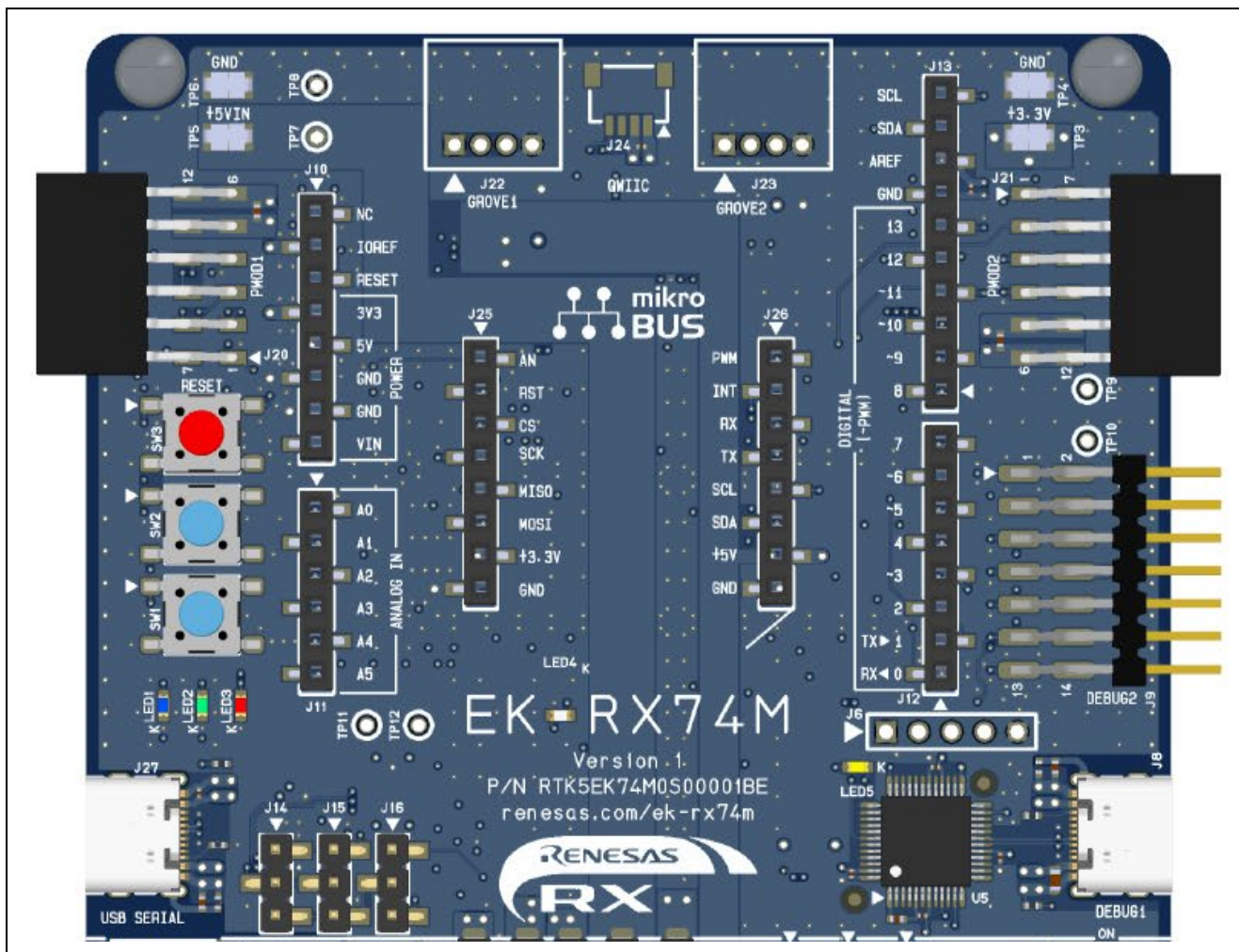


Figure 9. System Control and Ecosystem Access Area

5.1 Power

The EK-RX74M v1 is designed for 5 V operation. On-board Linear Regulators are used to convert the 5 V supply to 3.3 V, 2.5 V, and 1.0 V supply.

The following section describes the different ways in which EK-RX74M v1 can be powered. Power from each source is connected to the Main System 5 V Power (5.0 V). Reverse current protection is provided so that multiple power sources may be connected to the EK-RX74M v1 simultaneously.

Note: Power to the EK-RX74M v1 cannot be supplied by an external debugger (For example: E2 emulator Lite).

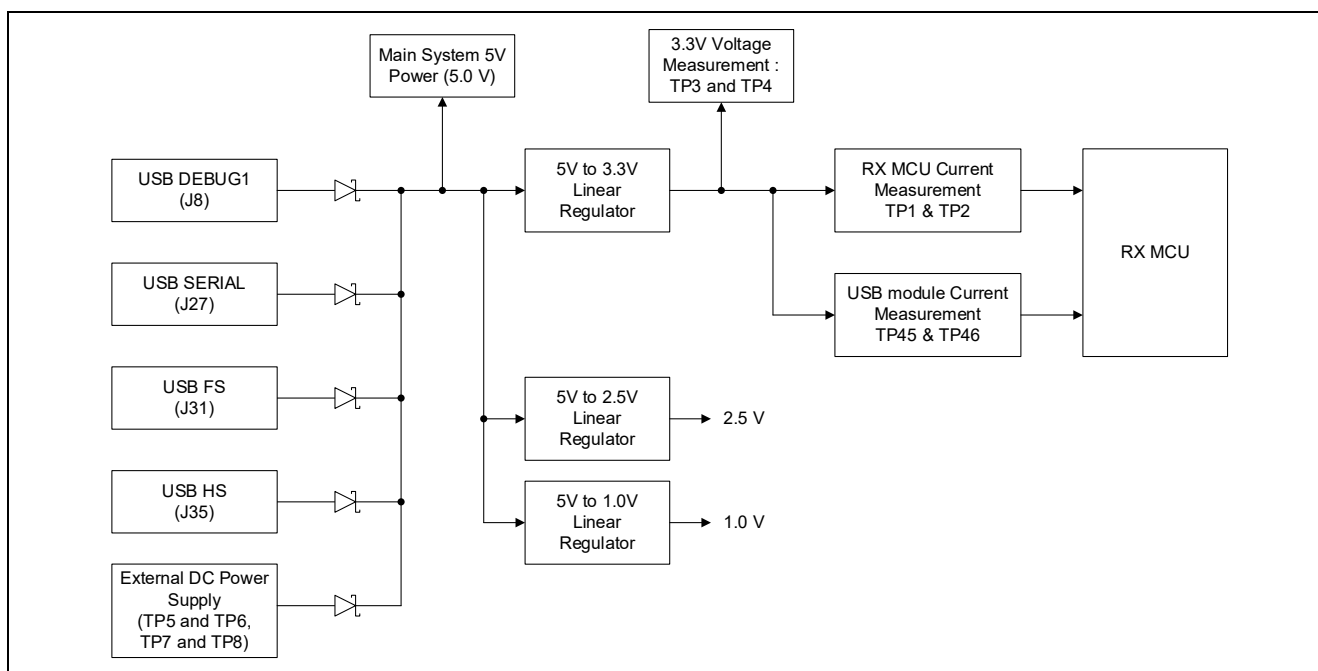


Figure 10. Power Supply

5.1.1 USB DEBUG1

5 V may be supplied from an external USB host to the USB connector (J8) labelled DEBUG1 on the board.

5.1.2 USB HIGH-SPEED

5 V may be supplied from an external USB host to the USB connector (J35) labelled USB HS on the board.

5.1.3 USB FULL-SPEED

5 V may be supplied from an external USB host to the USB connector (J31) labelled USB FS on the board.

5.1.4 USB SERIAL

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

5.1.5 External DC Power Supply

5 V may be supplied from an external power supply to test points on the board. TP5 (5V IN) 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.

5.1.6 Power Supply Considerations

Voltage of Main System 5 V Power will be lower than the power supply voltage because of the forward voltage (max 0.5V@3A) 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, Pmod 1, Grove 1, mikroBUS, USB High-Speed (when the USB High-Speed module of the RX MCU operates at host mode) and USB Full-Speed (when the USB Full-Speed module of the RX MCU operates at host mode).

The maximum current that could be supplied to the EK-RX74M v1 is as shown below, and this includes the current consumed by external boards connected to the ecosystem connectors and breakout pin headers.

Power supply from USB: max. 500 mA each USB port

Power supply from TP5 and TP6: max. 1.8 A

5.1.7 Power-up Behavior

When powered, the white LED near the center of the board (the “dash” in the EK-RX74M name) will light up. For more details on initial power-up behavior, see *EK-RX74M Quick Start Guide*.

5.2 Debug

The EK-RX74M v1 supports the following debug modes.

Table 4. Debug Modes

Debug Modes	Debug Circuit (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 (J8)
Debug in	External debugging tools (For example: E2 emulator Lite)	RX MCU (on-board)	JTAG, SWD, FINE	14-pin male header (J9)

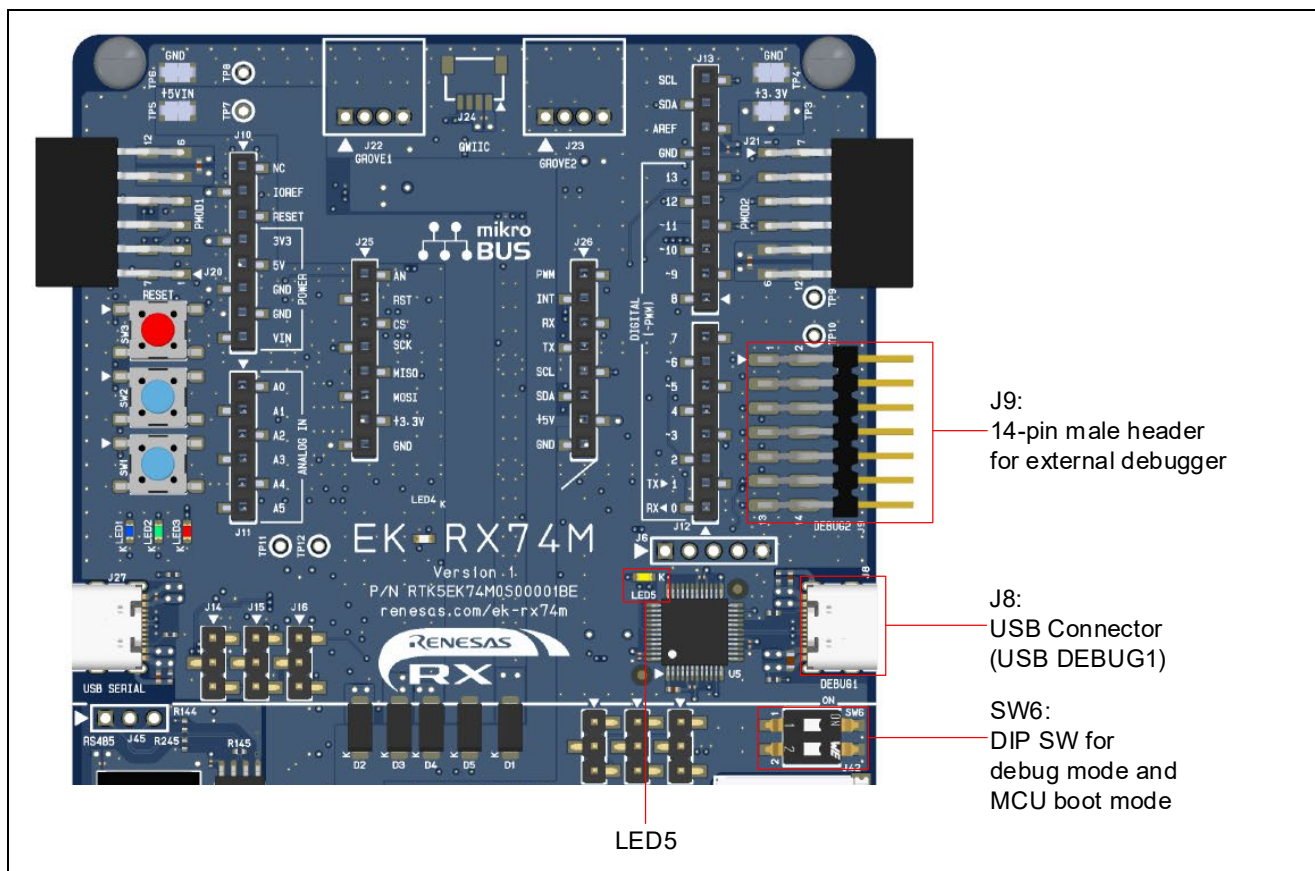
Notes:

- See [Table 6](#) for the USB DEBUG1 connector pin definition.
- See [Table 9](#) for the 14-pin male header definition.

The following table summarizes the DIP SW setting for each of the debug modes.

Table 5. DIP SW Summary for Different Debug Modes

Debug Modes	SW6-Pin1	SW6-Pin2
Debug on-board	OFF	OFF
Debug in	ON	OFF



5.2.1 Debug On-Board

The debug on-board functionality is provided using E2 OB circuit on the EK-RX74M v1. USB DEBUG1 connector (J8) 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.

Note that connecting the same host PC to multiple EK-RX74M v1 is not possible.

Table 6. USB DEBUG1 Connections

USB DEBUG1 Connector		EK-RX74M v1
Pin	Description	Signal
J8-A4/B9	VBUS	+5V_USB_DBG
J8-A9/B4	VBUS	+5V_USB_DBG
J8-A5	CC1	5.1kΩ pull-down
J8-B5	CC2	5.1kΩ pull-down
J8-A6	D+1	USBDBG_DP
J8-B6	D+2	USBDBG_DP
J8-A7	D-1	USBDBG_DM
J8-B7	D-2	USBDBG_DM
J8-A8	SBU1	N.C.
J8-B8	SBU2	N.C.
J8-A1/B12	GND	GND
J8-A12/B1	GND	GND

A yellow indicator, LED5, shows the status of the debug interface. When the EK-RX74M v1 is powered and LED5 is lit, it indicates that the host PC recognizes the E2 OB circuit.

To configure the EK-RX74M v1 to use the Debug on-board mode, configure the DIP SW using the following table.

Table 7. Debug On-Board DIP SW Configuration

Location	Configuration	Function
SW6-Pin1	OFF	E2 OB circuit enabled
SW6-Pin2	OFF	MD / FINED connected to 3.3 V through a pull-up resistor

5.2.2 Debug in

One 14-pin male header at J9 supports JTAG, SWD and FINE debug. They may be used for the external debug of the target RX MCU.

Note: Power to the EK-RX74M v1 cannot be supplied by an external debugger (ex. E2 emulator Lite).

To configure the EK-RX74M v1 to use the Debug in mode, configure the DIP SW using the following table.

Table 8. Debug in Mode DIP SW Configuration

Location	Configuration	Function
SW6-Pin1	ON	E2 OB circuit disabled
SW6-Pin2	OFF	MD / FINED connected to 3.3 V through a pull-up resistor

Table 9. 14-pin Male Header for an External Debugger Connections

14-pin male header for external debugger				EK-RX74M v1
Pin	JTAG Pin Name	SWD Pin Name	FINE Pin Name	Signal
J9-1	TCK	SWCLK	N.C.	P301 (TCK / SWCLK)
J9-2	GND	GND	GND	GND
J9-3	N.C.	N.C.	N.C.	N.C.
J9-4	N.C.	N.C.	N.C.	N.C.
J9-5	TDO	N.C.	N.C.	P302 (TXD001-A / TDO) *1
J9-6	N.C.	N.C.	N.C.	N.C.
J9-7	MD	N.C.	MD / FINED	MD_FINED
J9-8	VCC	VCC	VCC	3.3 V
J9-9	TMS	SWDIO	N.C.	P300 (TMS / SWDIO)
J9-10	N.C.	N.C.	N.C.	N.C.
J9-11	TDI	N.C.	N.C.	P303 (RXD001-A / TDI) *1
J9-12	GND	GND	GND	GND
J9-13	RES#	RES#	RES#	RES#
J9-14	GND	GND	GND	GND

*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 means to connect third-party add-on modules compatible with five most popular ecosystems using the following connectors:

- Two Seeed Grove system (I²C / Analog) connectors (not fitted)
- SparkFun Qwiic connector (not fitted)
- Two Digilent Pmod (UART / SPI / I²C) connectors
- Arduino connector
- 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 and 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-RX74M v1 simultaneously because the RX MCU pins which are connected to third party add-on modules are multiplexed. Confirm the specifications of this product and *RX74M Group User's Manual: Hardware*.

5.3.1 Seeed Grove Connectors

5.3.1.1 Grove 1

A Seeed Grove I²C connector (not fitted) is located at J22. The RX MCU acts as a two-wire serial master, and a connected module acts as a two-wire serial slave.

To change pull-up voltage for the I²C from 3.3 V to 5.0 V, solder both pads of solder-bridge jumper E44 and cut the trace between pads of trace-cut jumper E45.

Note: The I²C signals are also connected to Pmod 1 and SDHI.

Table 10. Grove 1 Connections

Grove 1 Connector		EK-RX74M v1	Configuration	
Pin	Description	Signal	Closed	Open
J22-1	SCL	P202 (SD0_DAT0-C / SCL00-B) *1 *3	E48, E50	E70
J22-2	SDA	P203 (SD0_DAT1-C / SDA00-B) *1 *3	E49, E51	E71
J22-3	VCC	3.3 V	E47	E46
		5.0 V *2	E46	E47
J22-4	GND	GND		

*1. The signals are shared with Pmod 1 and SDHI.

*2. Not connected at shipping.

*3. Electrical characteristics for SCL00-B and SDA00-B are not guaranteed in I3C mode, or in I²C Fast-mode, Fast-mode Plus, or High-speed mode. For details, refer to the Electrical Characteristics section of the *RX74M Group User's Manual: Hardware*.

5.3.1.2 Grove 2

A Seeed Grove I²C / Analog connector (not fitted) is provided at J23. The RX MCU acts as a two-wire serial master, and a connected module acts as a two-wire serial slave. These ports are also available as two analog (ADC) inputs.

The I²C can be used by soldering trace between pads of copper jumper E52 and E53, and pull-up the I²C signals to 3.3 V. The analog input can be used by cutting trace between pads of copper jumper E52 and E53, and disconnect the I²C signals from 3.3 V pull-up.

Table 11. Grove 2 Connections

Grove 2 Connector		EK-RX74M v1	Configuration	
Pin	Description	Signal	Closed	Open
J23-1	SCL / AN	P900 (RXD001-C / SSCL001 / AN032) ^{*1 *2}	E54	E37
J23-2	SDA / AN	P901 (TXD001-C / SSDA001 / AN033) ^{*1 *2}	E55	E36
J23-3	VCC	3.3 V		
J23-4	GND	GND		

*1. The signals are shared with Arduino.

*2. Not connected at shipping.



Figure 12. Seeded Grove and SparkFun Qwiic Connectors

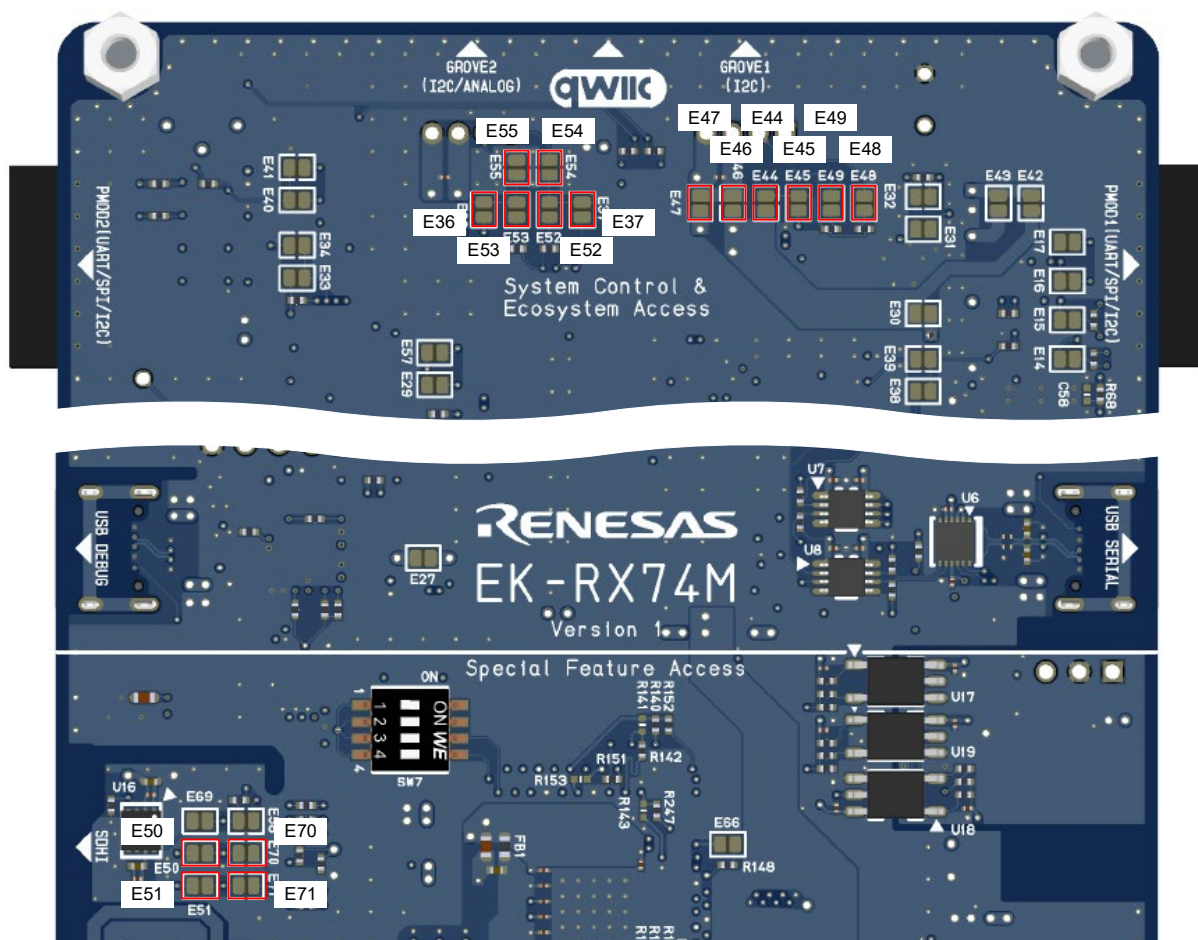


Figure 13. Grove Copper jumpers (bottom side)

5.3.2 SparkFun Qwiic Connector

A SparkFun Qwiic connector (not fitted) is provided at J24. The RX MCU acts as a two-wire serial master, and a connected module acts as a two-wire serial slave.

Table 12. Qwiic Connections

Qwiic Connector		EK-RX74M v1
Pin	Description	Signal
J24-1	GND	GND
J24-2	VCC	3.3 V
J24-3	SDA	P904 (TXD006-B / SMOSI006-B / SSDA006) ^{*1}
J24-4	SCL	P905 (RXD006-B / SMISO006-B / SSCL006) ^{*1}

*1: The signals are shared with Arduino, mikroBUS and Pmod 2.

5.3.3 Diligent Pmod Connectors

5.3.3.1 Pmod 1

A 12-pin Pmod Type-2A (expanded SPI), Type-3A (expanded UART) and Type-6A (expanded I²C) connector is provided at connector J20 labelled PMOD1. At Type-2A, the RX MCU acts as the SPI master, and the connected module acts as an SPI slave device. At Type-6A, the RX MCU acts as a two-wire serial master, and a connected module acts as a two-wire serial slave.

The Pmod 1 supports 3.3 V / 5 V devices of the I²C.

Table 13. Pmod 1 Connections

Pmod 1 Connector			EK-RX74M v1	Pmod 1 Configuration	
Pin	Option Type-2A / Type-3A	Default Type-6A	Signal	Closed	Open
J20-1	CS / CTS / GPIO	INT	P212 (CTS005# / SCK005-C / IRQ28) ^{*1 *3}	E39	E38
			P009 (IRQ25)	E38	E39
J20-2	MOSI / TXD	RESET	P214 (TXD005-C / SMOSI005-C)		
J20-3	MISO / RXD		P213 (RXD005-C / SMISO005-C) ^{*3}	J14-Pin1-2	
		SCL	P202 (SD0_DAT0-C / SCL00-B) ^{*2 *4}	J14-Pin2-3, E48, E50	
J20-4	SCK		P212 (CTS005# / SCK005-C / IRQ28) ^{*1 *3}	J15-Pin1-2	E39
	RTS / GPIO		P215 (RTS005#) ^{*3}	J15-Pin2-3, J16-Pin1-2	
		SDA	P203 (SD0_DAT1-C / SDA00-B) ^{*2 *4}	J15-Pin2-3, J16-Pin2-3, E49, E51	
J20-5	GND		GND		
J20-6	VCC		3.3 V	E43	E42
			5.0 V ^{*3}	E42	E43
J20-7	GPIO / INT (slave to master)		P007 (IRQ23-DS)	E14	
J20-8	GPIO / RESET (master to slave)		PG14	E15	
J20-9	GPIO / CS2		PG13	E16	
J20-10	GPIO / CS3		P111	E17	
J20-11	GND		GND		
J20-12	VCC		3.3 V	E43	E42
			5.0 V ^{*3}	E42	E43

*1. P212 is available as SCK005-C, CTS005# or IRQ28.

*2. The signals are shared with Grove 1 and SDHI.

*3. Not connected at shipping.

*4. Electrical characteristics for SCL00-B and SDA00-B are not guaranteed in I3C mode, or in I²C Fast-mode, Fast-mode Plus, or High-speed mode. For details, refer to the Electrical Characteristics section of the *RX74M Group User's Manual: Hardware*.

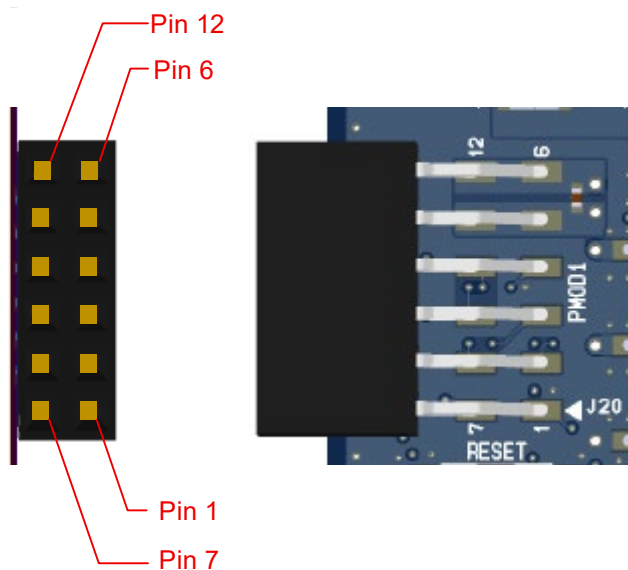


Figure 14. Pmod 1 connector

Pmod 1 Type-2A / 3A connection

The option for SPI (Type-2A) or UART (Type-3A) can be configured at Pmod 1. To configure the EK-RX74M v1 to use the Type-2A or Type-3A, configure the pin header jumpers and the copper jumpers using [Table 13](#). The following figures show the pin header jumpers and copper jumpers to use the Type-2A or Type-3A.

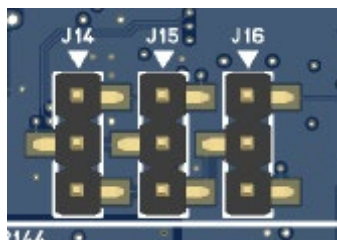


Figure 15. Pmod 1 Pin header jumpers (top side)

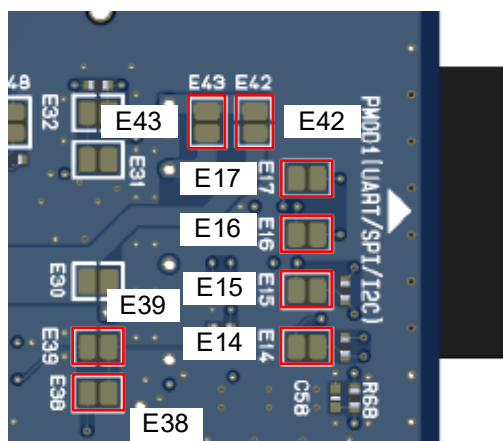


Figure 16. Pmod 1 Copper jumpers (bottom side)

5.3.3.2 Pmod 2

A 12-pin Pmod Type-2A (expanded SPI), Type-3A (expanded UART) and Type-6A (expanded I²C) connector is provided at connector J21 labelled PMOD2. At Type-2A, the RX MCU acts as the SPI master, and the connected module acts as an SPI slave device. At Type-6A, the RX MCU acts as a two-wire serial master, and a connected module acts as a two-wire serial slave.

Table 14. Pmod 2 Connections

Pmod 2 Connector			EK-RX74M v1	Pmod 2 Configuration	
Pin	Default Type-2A / Type-3A	Option Type-6A	Signal	Closed	Open
J21-1	CS / CTS / GPIO	INT	P903 (CTS006# / IRQ11) *1	E41	E40
			P902 (IRQ10)	E40	E41
J21-2	MOSI / TXD		P904 (TXD006-B / SMOSI006-B / SSDA006) *2 *3	J17-Pin2-3	J18-Pin1-2
		RESET	P702 *1	J17-Pin1-2	
J21-3	MISO / RXD	SCL	P905 (RXD006-B / SMISO006-B / SSCL006) *3		
J21-4	SCK		P906 (SCK006-B) *1	J19-Pin2-3	
	RTS / GPIO		P907 (RTS006#)	J18-Pin2-3, J19-Pin1-2	
		SDA	P904 (TXD006-B / SMOSI006-B / SSDA006) *1 *2	J18-Pin1-2, J19-Pin1-2	J17-Pin2-3
J21-5	GND		GND		
J21-6	VCC		3.3 V		
J21-7	GPIO / INT (slave to master)		P105 (IRQ29-DS)		
J21-8	GPIO / RESET (master to slave)		P415		
J21-9	GPIO / CS2		P207		
J21-10	GPIO / CS3		P310		
J21-11	GND		GND		
J21-12	VCC		3.3 V		

*1. Not connected at shipping.

*2. P904 is available as TXD006-B, SMOSI006-B or SSDA006.

*3. The signals are shared with Arduino, mikroBUS and Qwiic.

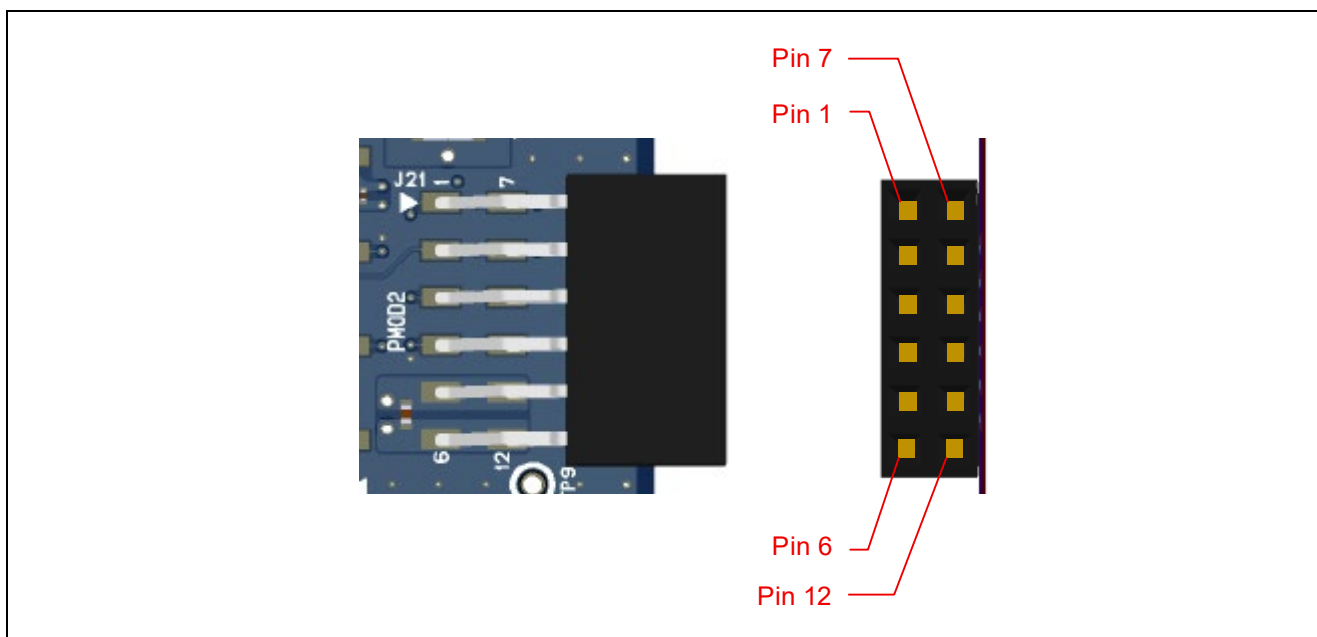


Figure 17. Pmod 2 connector

Pmod 2 Type-6A connection

The option for Type-6A (I²C) can be configured at Pmod 2 and supports 3.3 V devices. To configure the EK-RX74M v1 to use the I²C devices with 3.3 V operation, configure the pin header jumpers and the copper jumpers using [Table 14](#). Following figures show the pin header jumpers and copper jumpers to use the I²C devices.

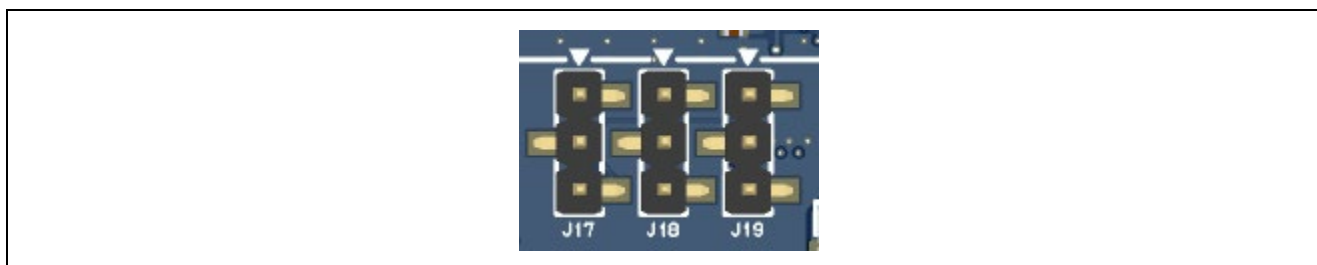


Figure 18. Pmod 2 Pin header jumpers (top side)

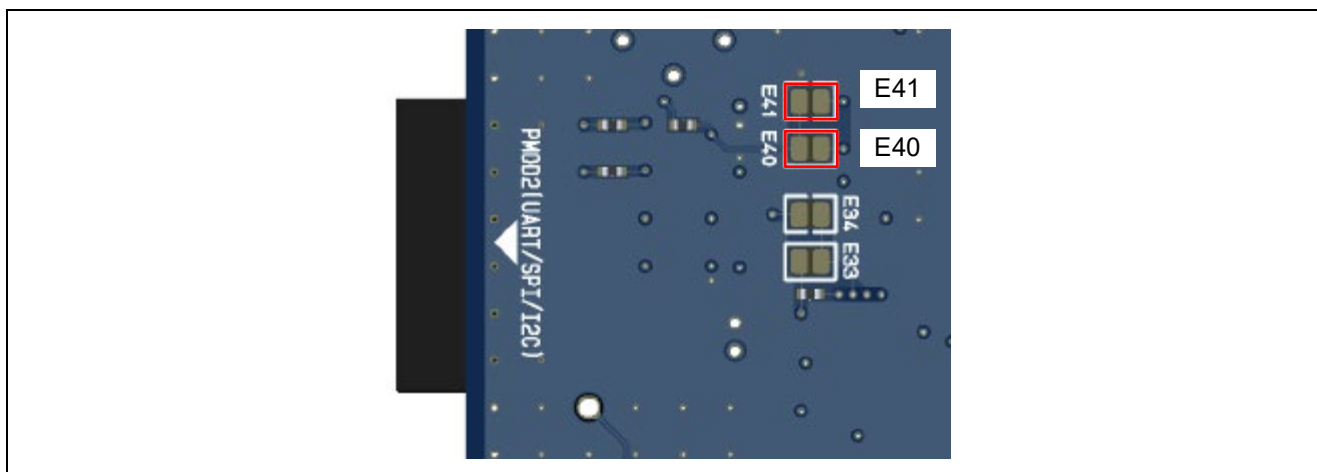


Figure 19. Pmod 2 Copper jumpers (bottom side)

5.3.4 Arduino Connector

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

Table 15. Arduino Connections

Arduino-Compatible Connector				EK-RX74M v1	Configuration	
Pin	Description			Signal	Closed	Open
J10-1	NC			N.C.		
J10-2	IOREF			3.3 V		
J10-3	RESET			RES#	E31	E32
				P008 (IRQ24) *1	E32	E31
J10-4	3.3 V			3.3 V		
J10-5	5 V			5.0 V *1	E30	
J10-6	GND			GND		
J10-7	GND			GND		
J10-8	VIN			N.C.		
J11-1	A0			P400 (AN000)		
J11-2	A1			P401 (AN001)		
J11-3	A2			P402 (AN002)		
J11-4	A3			P403 (AN003)		
J11-5	A4			P404 (AN004)		
J11-6	A5			P405 (AN005)		
J12-1	D0	RXD		P900 (RXD001-C / SSCL001 / AN032) *2	E37	E54
J12-2	D1	TXD		P901 (TXD001-C / SSDA001 / AN033) *2	E36	E55
J12-3	D2	INT0		P109 (IRQ17) *3	E35	E28
J12-4	D3	INT1	PWM	P802 (GTIOC1A / IRQ2)		
J12-5	D4			P108		
J12-6	D5		PWM	P500 (GTIOC2A)		
J12-7	D6		PWM	P100 (GTIOC12A)		
J12-8	D7			P407		
J13-1	D8			P110		
J13-2	D9		PWM	PF04 (GTIOC8A)		
J13-3	D10	SPI_SS	PWM	P507 (SSL20-B / GTIOC5B)	E33	E34
				P806 (GTIOC14A) *1	E34	E33
J13-4	D11	SPI_MOSI	PWM	P504 (MOSI2-B / GTIOC4A)		
J13-5	D12	SPI_MISO		P505 (MISO2-B)		
J13-6	D13	SPI_SCK		P506 (RSPCK2-B)		
J13-7	GND			GND		
J13-8	AREF			VREFH00		
J13-9	I2C_SDA			P904 (TXD006-B / SMOSI006-B / SSDA006) *4		
J13-10	I2C_SCL			P905 (RXD006-B / SMISO006-B / SSCL006) *4		

*1. Not connected at shipping.

*2. The signal is shared with Grove 2.

*3. The signal is shared with user switch SW2.

*4. The signal is shared with mikroBUS, Pmod 2 and Qwiic.

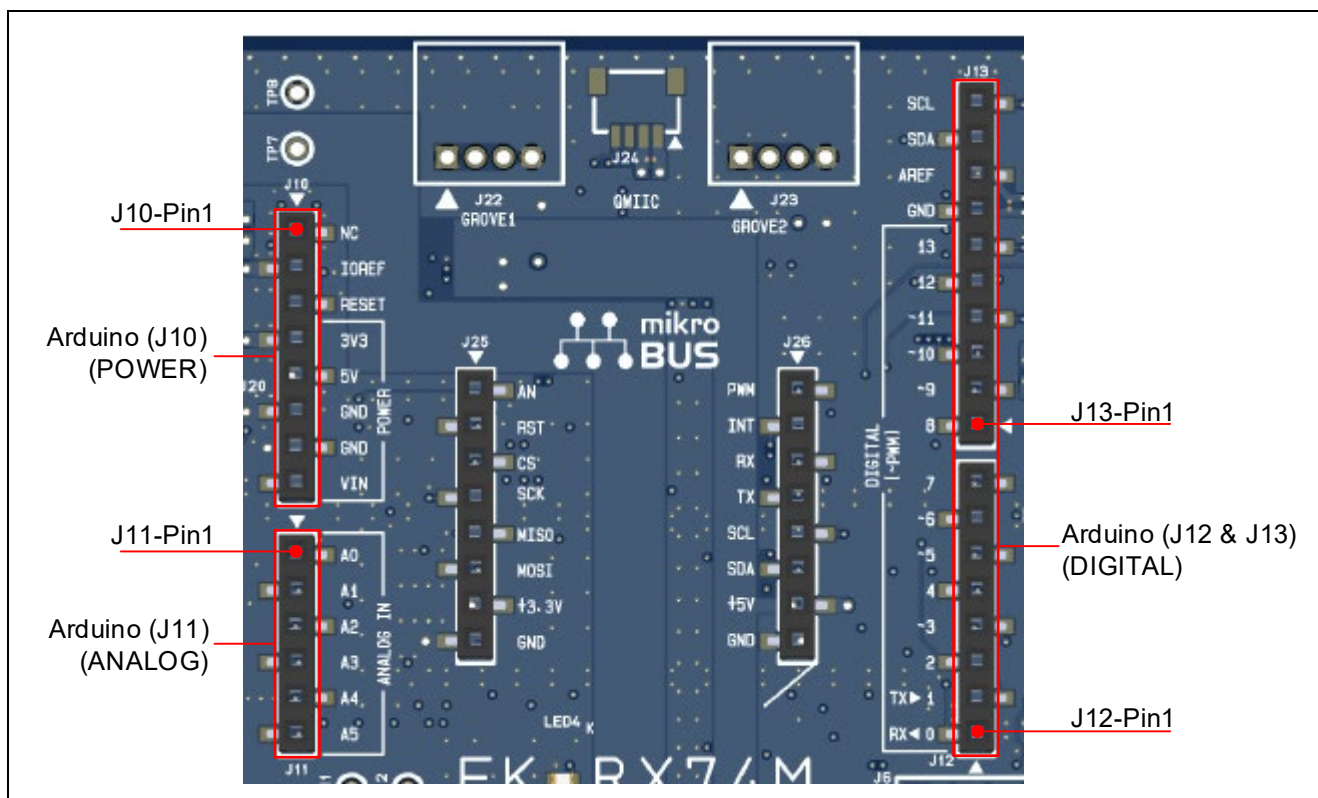


Figure 20. Arduino Connectors (J10, J11, J12 and J13)

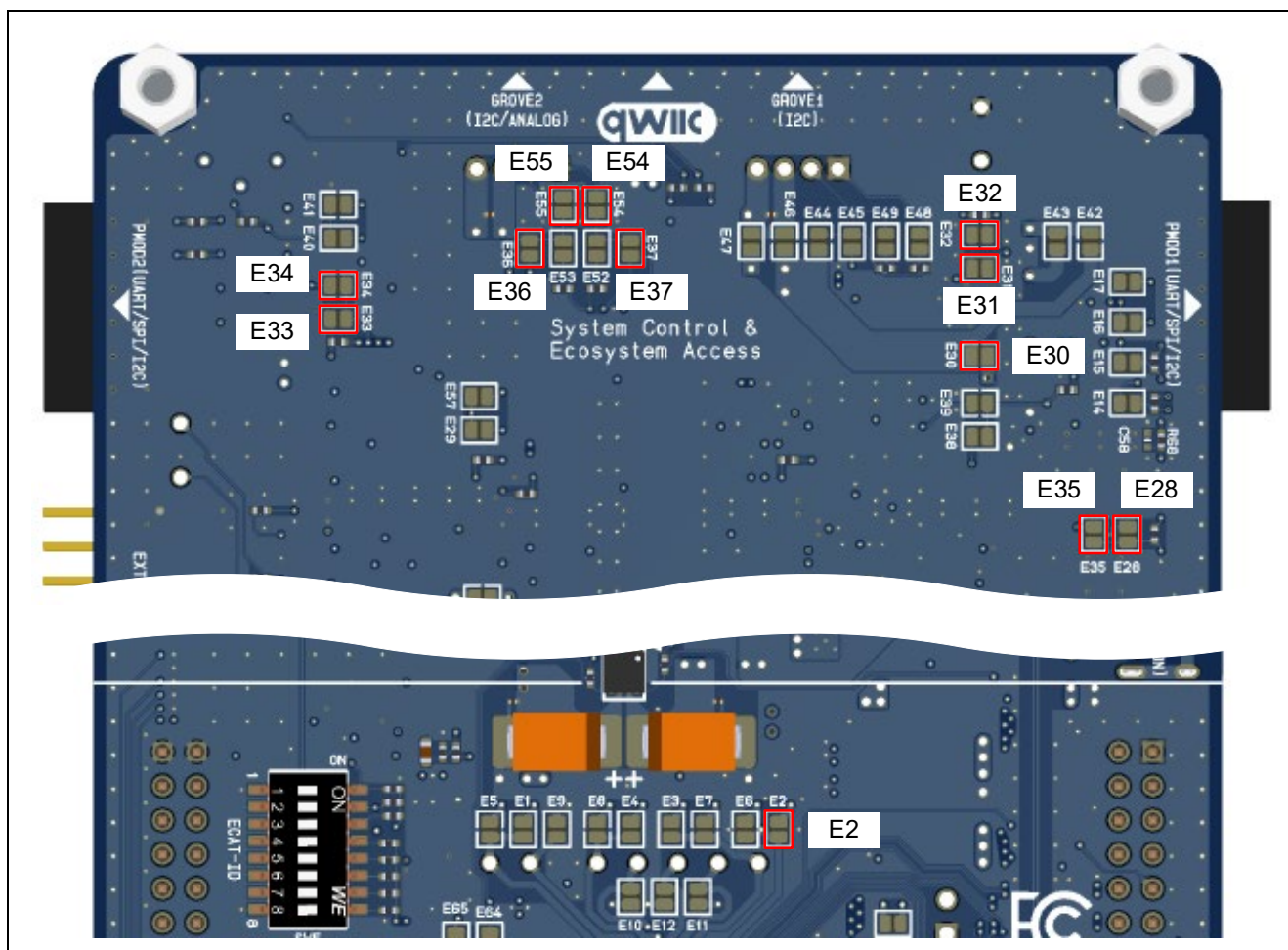


Figure 21. Arduino Copper jumpers (bottom side)

Arduino Shield Considerations

AREF (J13-Pin8) output from Arduino Shield is connected to VREFH00 (Analog reference voltage supply pin for the 16-bit A/D converter) of RX MCU, however, 3.3 V is connected to VREFH00 at default condition. When Arduino AREF supplies power to VREFH00, the user must disconnect VREFH00 from 3.3 V. Copper jumper E2 is provided on the EK-RX74M v1 to disconnect VREFH00 from 3.3 V.

The EK-RX74M v1 can supply 5 V power to J10-Pin5 of Arduino Shield by soldering copper jumper E30, however, some of the RX MCU pins which are connected to Arduino Shield are not 5 V tolerant. When the EK-RX74M v1 supplies 5 V power to an Arduino Shield, refer to the *RX74M Group User's Manual: Hardware* and the specifications of the Arduino Shield being used.

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 16. mikroBUS Connections

mikroBUS Connector		EK-RX74M v1	Configuration	
Pin	Description	Signal	Closed	Open
J25-1	AN (Analog)	P406 (AN006)		
J25-2	RST (Reset)	P412		
J25-3	CS (SPI Chip Select)	P211 (SSL10-D)		
J25-4	SCK (SPI Clock)	P208 (RSPCK1-D)		
J25-5	MISO	P210 (MISO1-D)		
J25-6	MOSI	P209 (MOSI1-D)		
J25-7	+3.3 V	3.3 V		
J25-8	GND	GND		
J26-1	PWM	P604 (GTIOC6A) ^{*1}	E57	E29
J26-2	INT (Hardware Interrupt)	P501 (IRQ1) ^{*2 *3}	E58	E69
J26-3	RX (UART Receive)	P005 (RXD000-B)		
J26-4	TX (UART Transmit)	P004 (TXD000-B)		
J26-5	SCL (I ² C Clock)	P905 (RXD006-B / SMISO006-B / SSCL006) ^{*4}		
J26-6	SDA (I ² C Data)	P904 (TXD006-B / SMOSI006-B / SSDA006) ^{*4}		
J26-7	+5 V	5.0 V ^{*2}	E56	
J26-8	GND	GND		

*1. The signal is shared with User LED3.

*2. Not connected at shipping.

*3. The signal is shared with FLT1# of SDHI power control IC (U16).

*4. The signals are shared with Arduino, Pmod 2 and Qwiic.

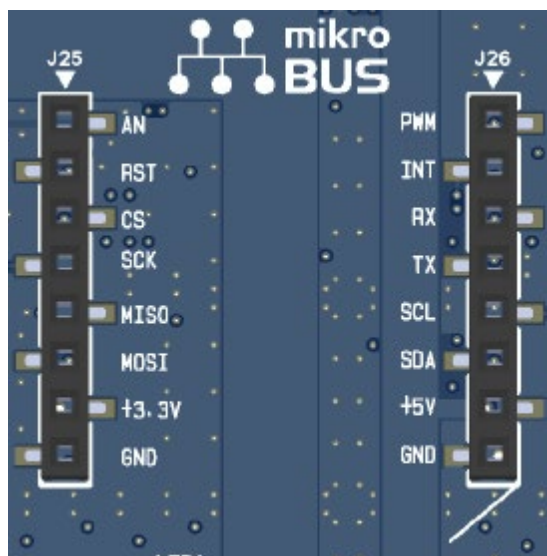
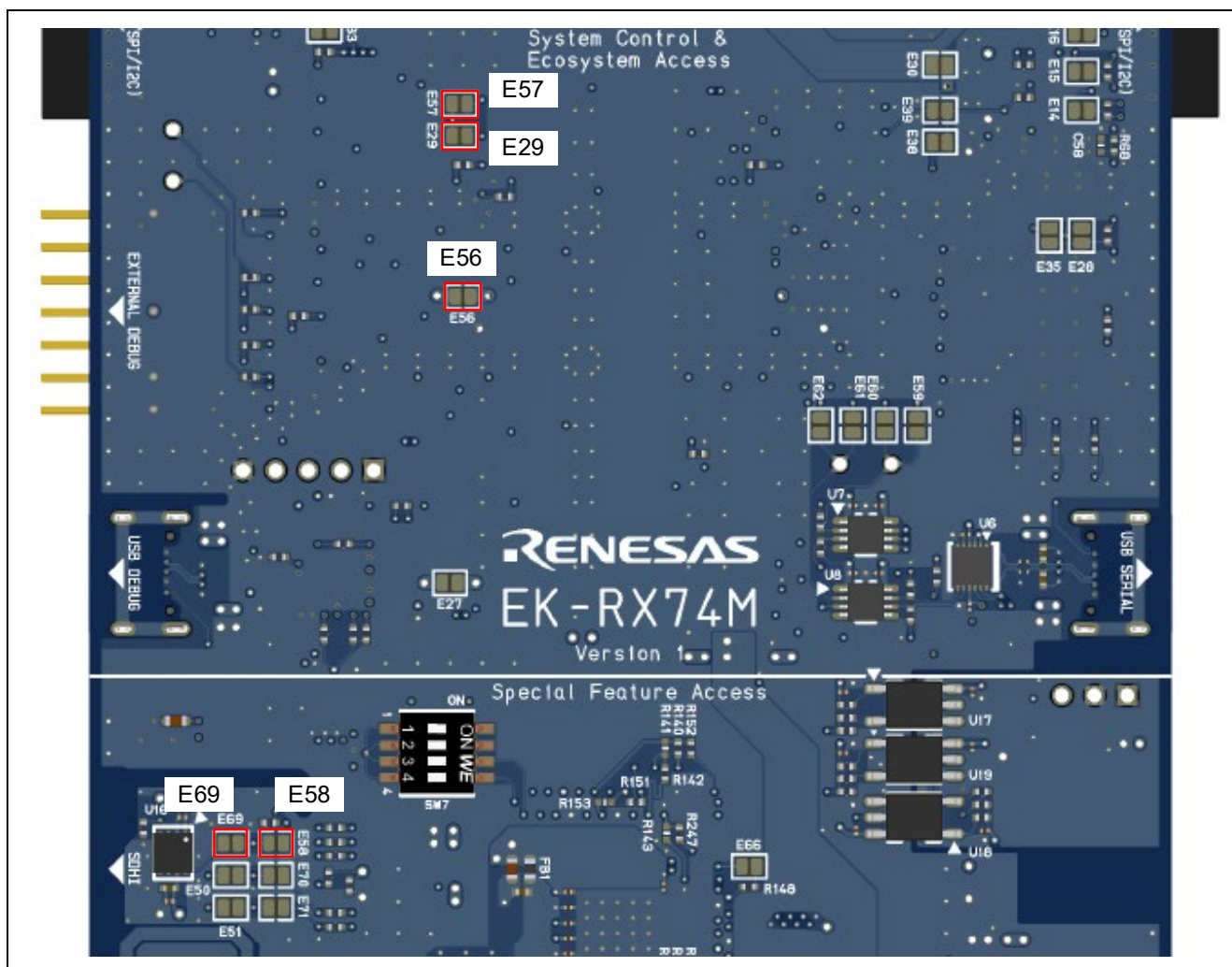


Figure 22. mikroBUS Connectors

mikroBUS CLICK BOARD Considerations

The EK-RX74M v1 can supply 5 V power to J26-Pin7 of mikroBUS CLICK BOARD by soldering copper jumper E56, however, some of the RX MCU pins which are connected to mikroBUS CLICK BOARD are not 5 V tolerant. When the EK-RX74M v1 supplies 5 V power to mikroBUS CLICK BOARD, the user must confirm the *RX74M 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 Type-C connector (J27) connects the RX MCU RSCI interface to an external USB interface through FTDI FT234XD-T (U6) with maximum baud rate of 3Mbps. The RX MCU RSCI can be configured either RSCI12 (default configuration) or RSCI1. Power from an external USB Host on this connection can be used to provide 5 V power to the EK-RX74M v1.

Table 17. USB to Serial Connections

USB to Serial Connector		EK-RX74M v1
Pin	Description	Signal
J27-A4/B9	VBUS	+5V_USB_SER
J27-A9/B4	VBUS	+5V_USB_SER
J27-A5	CC1	5.1kΩ pull-down
J27-B5	CC2	5.1kΩ pull-down
J27-A6	D+1	USBSER_DP
J27-B6	D+2	USBSER_DP
J27-A7	D-1	USBSER_DM
J27-B7	D-2	USBSER_DM
J27-A8	SBU1	N.C.
J27-B8	SBU2	N.C.
J27-A1/B12	GND	GND
J27-A12/B1	GND	GND

Table 18. FT234XD-T and RX MCU Connections

FT234XD-T		EK-RX74M v1		Configuration	
Pin	Description	Signal	Function	Closed	Open
U6-10	RXD	P302 (TXD001-A / TDO) *1	RSCI 1 Transmit Data	E59	E60
		P114 (TXD012-B)	RSCI 12 Transmit Data	E60	E59
U6-7	TXD	P303 (RXD001-A / TDI) *1	RSCI 1 Receive Data	E61	E62
		P115 (RXD012-B)	RSCI 12 Receive Data	E62	E61
U6-8	RTS#	P113 (CTS012#)	RSCI 12 Clear to Send		
U6-11	CTS#	P112 (RTS012#)	RSCI 12 Request to Send		

*1: Not connected at shipping.

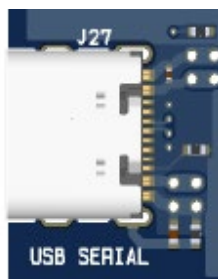


Figure 24. USB to Serial Connector

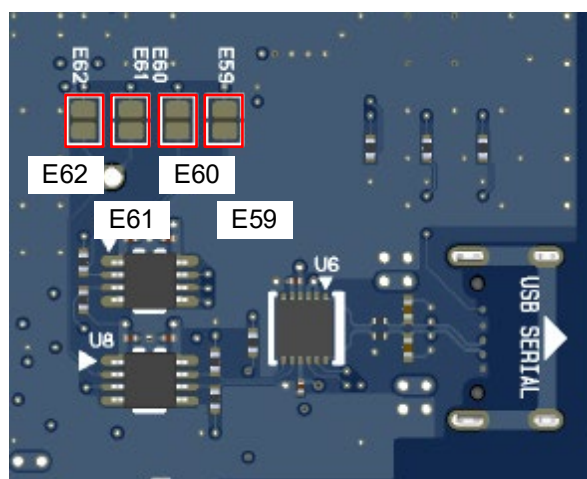


Figure 25. USB to Serial Copper jumpers (bottom side)

Install the FTDI Virtual COM Port (VCP) driver from the FTDI's website to use FT234XD-T:

<https://ftdichip.com/>

5.4.2 USB Full-Speed

The USB Type-C connector (J31) connects the RX MCU USB Full-Speed interface (USBf) to an external USB interface. It supports communications for testing and use of the RX MCU firmware. This connection can be configured as either a USB Function or a USB Host interface.

The USB Function mode can be configured as either bus-powered (As described in section 5.1, the EK-RX74M v1 has multiple input power sources in addition to this VBUS) or self-powered mode. To configure USB function mode (bus-powered or self-powered):

- Configure the jumpers and DIP switches as shown in [Table 20](#).
- Configure the RX MCU firmware for USB full-speed function mode.

An external USB host connected to the USB Type-C connector can provide power to the EK-RX74M v1.

For the USB Host configuration, set the jumpers and DIP switch according to [Table 20](#), and configure the RX MCU firmware to operate the USB Full-Speed ports in Host mode. In this configuration, U9 (the power control IC) controls the USB power output and supplies 5 V / 500 mA to the connected USB function device. Configure the RX MCU firmware according to [Table 21](#) to enable U9 and monitor its overcurrent detection function.

NOTE: The input power sources must be configured with enough power for both the EK-RX74M v1 and the USB Full-Speed port in host mode.

DIP SW (SW4) which controls voltage of CC pins (J31-Pin A5 and B5) of the USB Type-C connector (J31) is provided on the EK-RX74M v1. The [Table 20](#) shows configuration of the DIP SW at the host mode and the function mode.

Table 19. USB Full-Speed Connections

USB Full-Speed Connector		EK-RX74M v1
Pin	Description	Signal
J31-A4/B9	VBUS	+5V_USBFS (Function Mode) +5V_H_USBFS (Host Mode)
J31-A9/B4	VBUS	+5V_USBFS (Function Mode) +5V_H_USBFS (Host Mode)
J31-A5	CC1	Refer to Table 20
J31-B5	CC2	Refer to Table 20
J31-A6	D+1	PF00(USB0_DP)
J31-B6	D+2	PF00(USB0_DP)
J31-A7	D-1	PF01(USB0_DM)
J31-B7	D-2	PF01(USB0_DM)
J31-A8	SBU1	N.C.
J31-B8	SBU2	N.C.
J31-A1/B12	GND	GND
J31-A12/B1	GND	GND

Table 20. USB Full-Speed Pin Header Jumper and DIP SW (SW4) Configuration

USBf Operating Mode		J28	J30	SW4
Host Mode		Open	Jumper on pins 1-2	Pin5 ON, Pin7 ON, Pin11 ON, Pin12 ON, Pin6 OFF, Pin8 OFF
Function Mode	Bus-power	Jumper on pins 1-2	Jumper on pins 2-3	Pin5 OFF, Pin7 OFF, Pin11 OFF, Pin12 OFF, Pin6 ON, Pin8 ON
	Self-power	Open	Jumper on pins 2-3	

Note: When using the USB Function mode, if power is supplied to the EK-RX74M v1 while SW4-Pin 11, 12 are set to ON, the USB CC voltage will be temporarily applied to the RX MCU while it is inactive. To prevent potential damage to the RX MCU, ensure that these settings are switched to OFF before supplying power.

Table 21. USB Full-Speed Power Control IC

U9 USB Full-Speed Power Control IC		EK-RX74M v1	Configuration	
Signal	Function	Signal	Closed	Open
USB0_VBUSEN	VBUS supply enable signal	P304 (ETHPHYCLK / USB0_VBUSEN)	E64	E65
USB0_OVRCURA-DS	Overcurrent detection signal	P104 (USB0_OVRCURA-DS)		

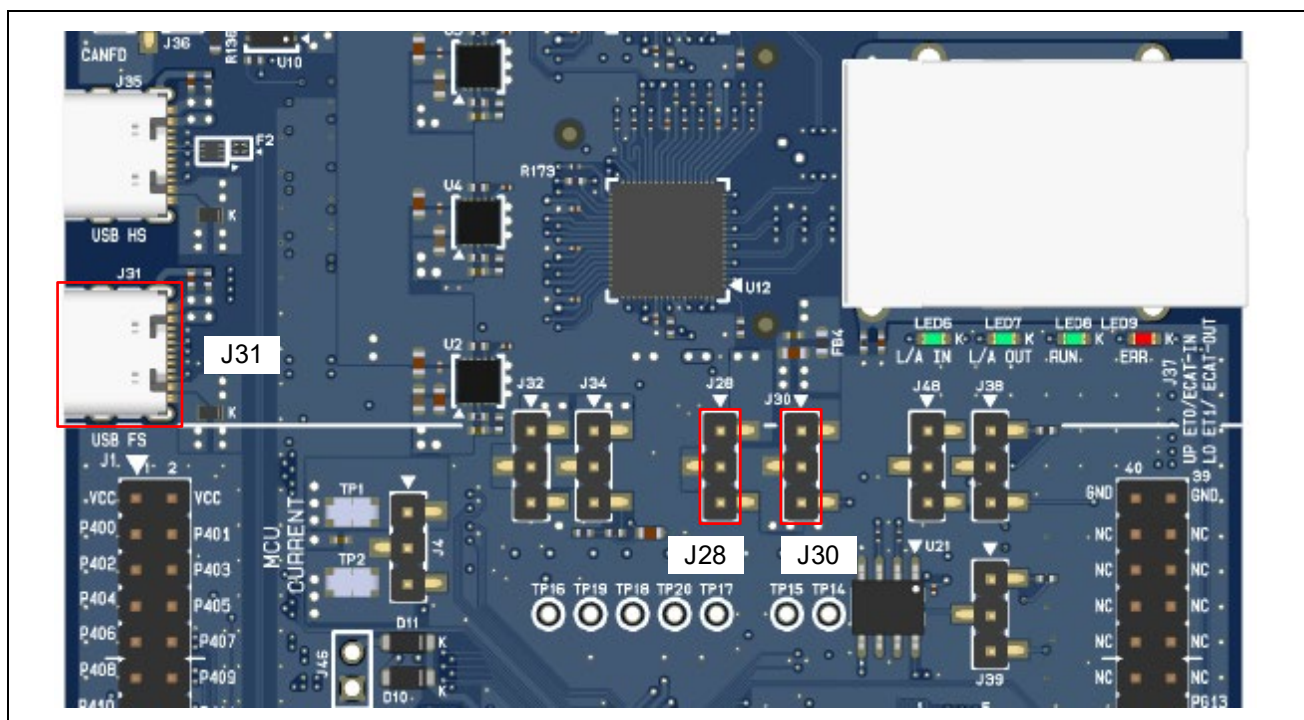


Figure 26. USB Full-Speed Connector and Pin Headers (top side)

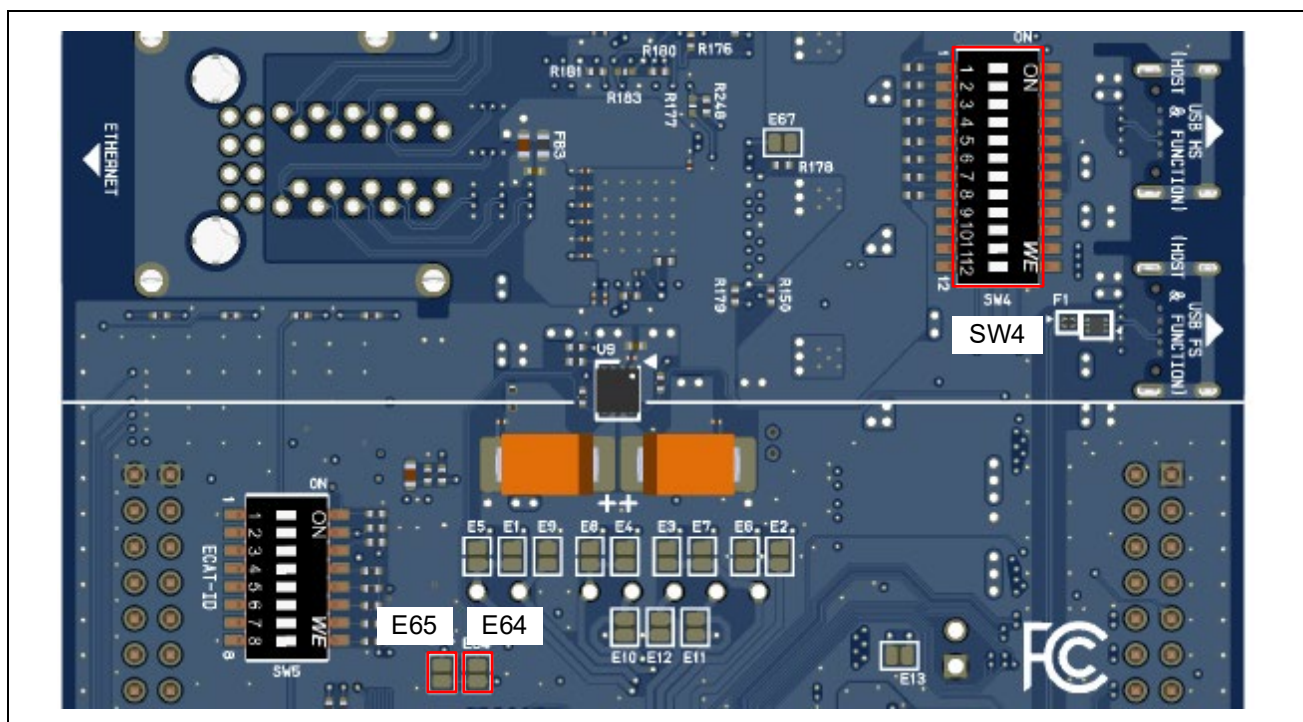


Figure 27. USB Full-Speed Copper jumpers and DIP SW (bottom side)

5.5 Miscellaneous

5.5.1 LED

Five LEDs are provided on the EK-RX74M v1. Refer to section 6.3 for LEDs of the Ethernet system.

Behavior of the LEDs on the EK-RX74M v1 is described in the following table. User LEDs are active high on the RX MCU ports.

Table 22. EK-RX74M v1 LED Functions

LED			EK-RX74M v1	Configuration	
Designator	Color	Function	Signal	Closed	Open
LED1	Blue	User LED	PF05 (GTIOC8B)		
LED2	Green	User LED	P807 (GTIOC14B)		
LED3	Red	User LED	P604 (GTIOC6A) ^{*1}	E29	E57
LED4	White	Power LED	3.3 V		
LED5	Yellow	Debug LED	E2 OB circuit		

*1. The signal is shared with mikroBUS.

The User LEDs may be isolated from the RX MCU, so the associated ports can be used for other purposes. To separate LED3 from P604, copper jumper E29 must be open.



Figure 28. User LEDs



Figure 29. Power LED

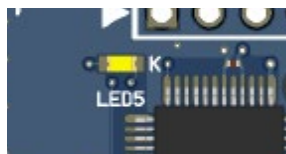


Figure 30. Debug LED

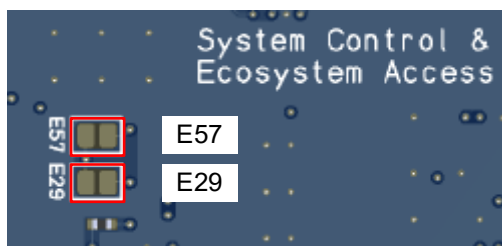


Figure 31. User LEDs Copper jumpers (bottom side)

5.5.2 User and Reset Switches

Three miniature, momentary, mechanical push-button type SMT switches are mounted on the EK-RX74M v1. Pressing the Reset switch (SW3) generates a reset signal to reset the RX MCU. The signals which are connected to the user switches (SW1 and SW2) are at low level while the user switches are pressed.

Table 23. EK-RX74M v1 Switches

Switch			EK-RX74M v1	Configuration	
Designator	Color	Function	Signal	Closed	Open
SW3	Red	Reset Switch	RES#		
SW2	Blue	User Switch	P109 (IRQ17) *1	E28	E35
SW1	Blue	User Switch	P414 (IRQ30)		

*1. The signal is shared with Arduino.

The user switch SW2 may be isolated from the RX MCU, so the associated ports can be used for other purposes. To separate SW2 from P109, copper jumper E28 must be open.

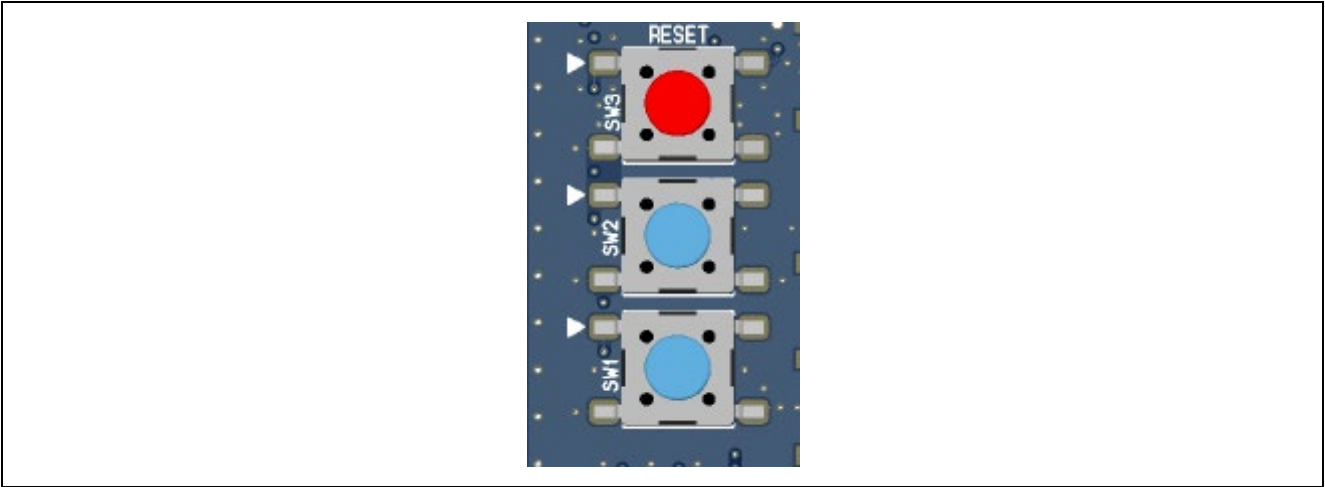


Figure 32. Reset and User Switches

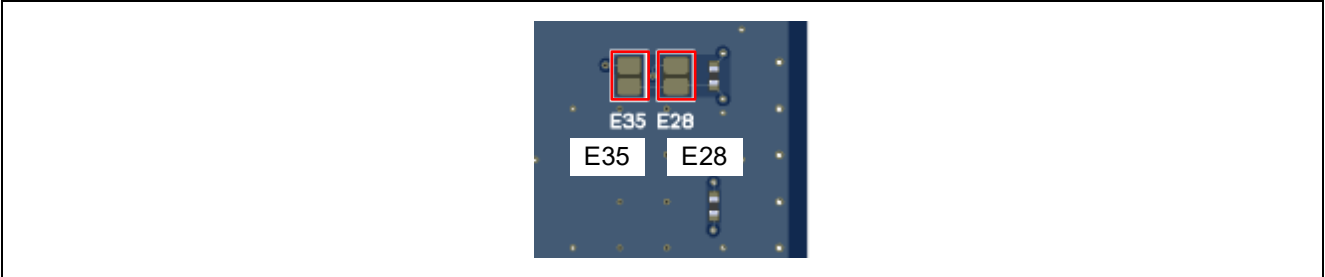


Figure 33. User switches Copper jumpers (bottom side)

5.5.3 Debug mode and MCU boot mode

DIP SW (SW6) is provided on the EK-RX74M v1 to configure the debug mode and RX MCU boot mode.

Table 24. Debug mode and MCU boot mode

SW6-Pin1	SW6-Pin2	Description
OFF	OFF	Debug on-board mode
ON	OFF	Standalone Operation mode or Debug in mode
ON	ON	SCI Boot mode ^{*1} , USB Boot mode ^{*2}

*1. To boot from SCI using USB to Serial, cut copper jumper E60 and E62, solder copper jumper E59 and E61.

*2. The USB cable must be connected on reset release.

6. Special Feature Access Area

The Special Feature Access area provides features specific to the RX74M group such as CAN FD, RS-485, Ethernet system, DSMIF, USB High-Speed, microSD card slot, OctalRAM and OctaFlash.

The DSMIF connectors, OctalRAM and OctaFlash are among the Special Feature Access features. Normally, it would be in the Special Feature Access area, however, to optimize the layout, routing, and performance, it is placed in the MCU Native Pin Access area.

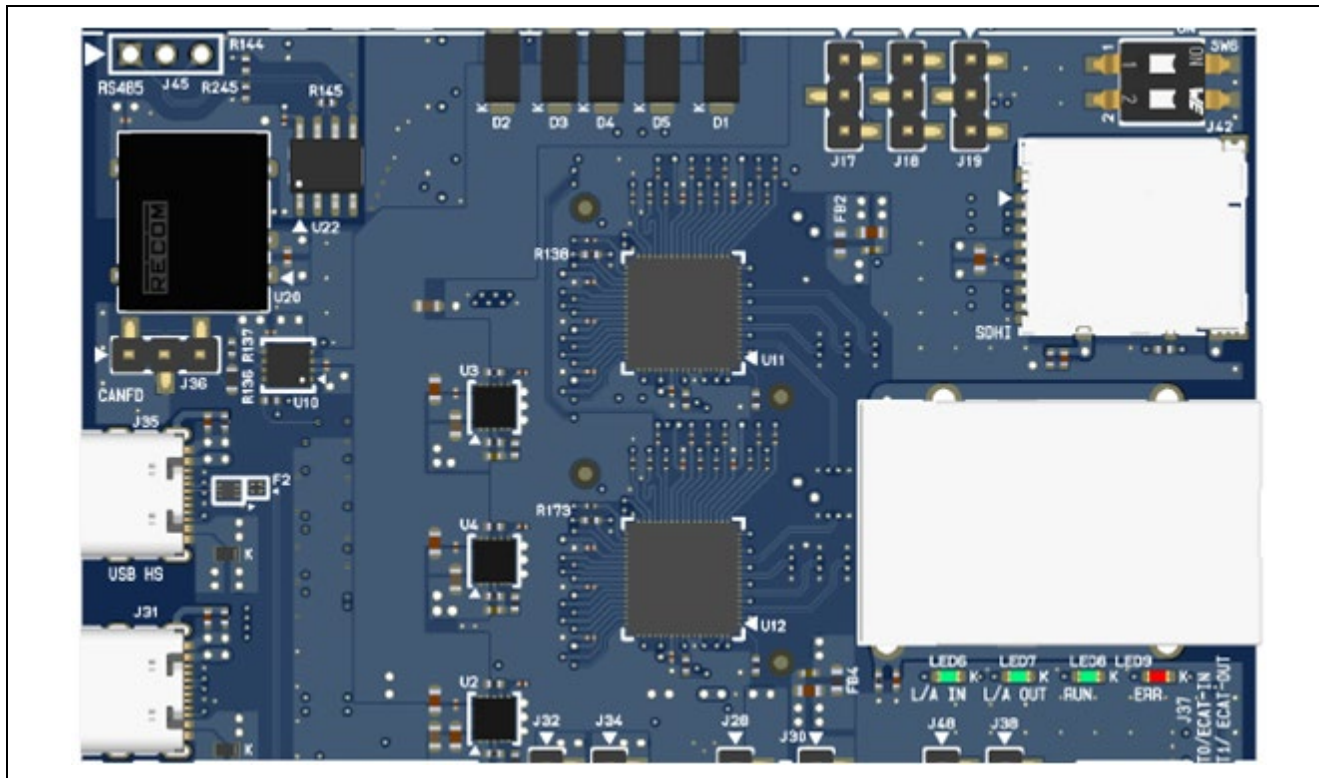


Figure 34. Special Feature Access Area

6.1 CAN FD (Controller Area Network with Flexible Data Rate)

A CAN FD transceiver IC (U10) is provided on the EK-RX74M v1. The RX MCU incorporates CAN FD module. Refer to the *RX74M Group User's Manual: Hardware* for details of the CAN FD module.

Table 25. CAN FD transceiver IC and RX MCU Connections

CAN FD transceiver IC		EK-RX74M v1
Pin	Description	Signal
U10-1	TXD	P804 (CTX0)
U10-2	VSS	GND
U10-3	VDD	5.0 V
U10-4	RXD	P805 (CRX0)
U10-5	VIO	3.3 V
U10-6	CANL	CAN-L
U10-7	CANH	CAN-H
U10-8	S (Silent Mode Input)	P006

The differential signals of CAN-H and CAN-L are connected to CAN FD interface connector J36 (3-pin male header).

Table 26. CAN FD Connections

CAN FD Connector	EK-RX74M v1
Pin	Signal
J36-1	CAN-H
J36-2	GND
J36-3	CAN-L

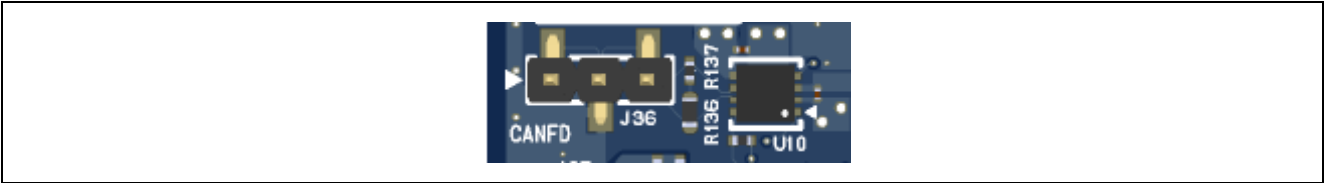


Figure 35. CAN FD

6.2 $\Delta\Sigma$ Modulator Interface (DSMIF)

Two connectors (J40 and J41) for DSMIF are provided on the EK-RX74M v1, and connected to DSMIF incorporated in the RX MCU. The connectors (not fitted) on the EX-RX74M v1 are 10-pin (2 x 5-pin) socket connectors with 2.54 mm pitch.

EK-RX74M v1 can supply 5 V from J40-Pin1 and J41-Pin1, however, RX MCU I/O pins which are connected to J40 and J41 are not 5 V tolerant.

Table 27. DSMIF 1 Connections

DSMIF 1 Connector Pin	EK-RX74M v1 Signal	Configuration	
		Closed	Open
J40-1	5.0 V		
J40-2	3.3 V		
J40-3	P000 (DSM0_CLK0-B / CATRESTOUT) *1	J43-Pin1-2	
J40-4	P001 (DSM0_DAT0-B)		
J40-5	P002 (DSM0_CLK1-B)		
J40-6	P003 (DSM0_DAT1-B)		
J40-7	P311 (DSM0_CLK2-C)		
J40-8	P312 (DSM0_DAT2-C)		
J40-9	GND		
J40-10	GND		

*1. The signal is shared with Ethernet system.

Table 28. DSMIF 2 Connections

DSMIF 2 Connector Pin	EK-RX74M v1 Signal
J41-1	5.0 V
J41-2	3.3 V
J41-3	PF02 (DSM1_CLK0-F)
J41-4	PF03 (DSM1_DAT0-F)
J41-5	P012 (DSM1_CLK1-E)
J41-6	P013 (DSM1_DAT1-E)
J41-7	P014 (DSM1_CLK2-E)
J41-8	P015 (DSM1_DAT2-E)
J41-9	GND
J41-10	GND

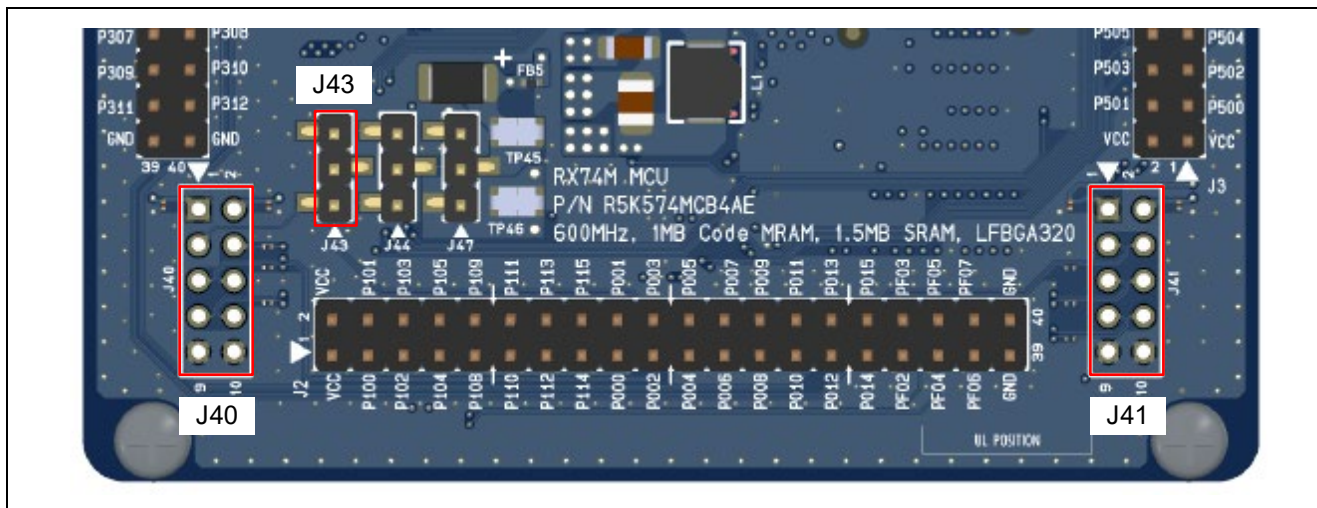


Figure 36. DSMIF Connectors and Pin Header

6.3 Ethernet System

When running any Ethernet software, do so with the use of a unique MAC address. A sticker indicating the unique MAC address that was assigned by Renesas is affixed to the Ethernet connector to ensure full compatibility in the case of connection to other Renesas hardware modules.

An EtherCAT ID number is required to execute the EtherCAT slave controller software. Please use SW5 as required.

Two Ethernet PHY IC (VSC8541XMV-02) and Ethernet connector (J37) with 2 ports are provided on the EK-RX74M v1, and connected to Layer 3 Ethernet Switch Module (ESWM) incorporated in the RX MCU. The upper port of the J37 is connected to the U11 and the lower port of the J37 is connected to the U12. The RX MCU incorporates 2 port PHY interface (ET0 and ET1), ET0 is connected to U11 and ET1 is connected to U12.

Hardware Mode Strapping option for the PHY ICs on the EK-RX74M v1 are set according to [Table 29](#). Refer to the PHY ICs datasheet in detail.

Table 29. Hardware Mode Strapping Option Settings

PHY IC Pin	Function	U11 Settings	U12 Settings
RX_CLK	Managed or Unmanaged Mode	Unmanaged Mode	Unmanaged Mode
RXD2	Link Advertisement Settings	Default Mode (10 / 100 / 1000 FDX / HDX, autoneg ON)	Default Mode (10 / 100 / 1000 FDX / HDX, autoneg ON)
RXD3	Link Advertisement Settings		
RX_DV / RX_CTL	MII/GMII or RMII Interface Mode	MII/GMII Mode	MII/GMII Mode
MII_TXCLK			
RXD4	PHY Address bit 0 in Unmanaged Mode	00	01
RXD5	PHY Address bit 1 in Unmanaged Mode		

The EK-RX74M v1 supports MII interface, GMII interface, RMII interface and EtherCAT. Each interface and EtherCAT can be selected by a DIP SW with 4 poles (SW7).

Table 30. Interface and EtherCAT Configuration

Interface	U11 Settings		U12 Settings	
	SW7-Pin1	SW7-Pin2	SW7-Pin3	SW7-Pin4
MII	OFF	OFF (Don't care)	OFF	OFF (Don't care)
GMII	OFF	OFF	OFF	OFF
RMII	ON	OFF (Don't care)	ON	OFF (Don't care)
EtherCAT	OFF	ON	OFF	ON

Table 31. Ethernet PHY IC (U11) Connections

Ethernet PHY IC					EK-RX74M v1	Configuration	
Pin	MII	GMII	RMII	EtherCAT	Signal and destination	Closed	Open
U11-1	REF_REXT				2kΩ to GND		
U11-2	VDD25A				2.5 V		
U11-3	-	P0_D3N	-		J37-Pin UP7 (UP_D3N)		
U11-4	-	P0_D3P	-		J37-Pin UP8 (UP_D3P)		
U11-5	VDD1A				1.0 V		
U11-6	-	P0_D2N	-		J37-Pin UP5 (UP_D2N)		
U11-7	-	P0_D2P	-		J37-Pin UP6 (UP_D2P)		
U11-8	VDD25A				2.5 V		
U11-9	P0_D1N				J37-Pin UP3 (UP_D1N)		
U11-10	P0_D1P				J37-Pin UP4 (UP_D1P)		
U11-11	VDD25A				2.5 V		
U11-12	P0_D0N				J37-Pin UP1 (UP_D0N)		
U11-13	P0_D0P				J37-Pin UP2 (UP_D0P)		
U11-14	VDD1A				1.0 V		
U11-15	THERMDA				N.C.		
U11-16	THERMDC_VSS				N.C.		
U11-17	VDD1				1.0 V		
U11-18	COL		-		PG06 (ET0_COL)		
U11-19	CRS		-		PG07 (ET0_CRS)		
U11-20	-	RXD7	-		P511 (ET0_RXD7-A)		
U11-21	-	RXD6	-		P510 (ET0_RXD6-A)		
U11-22	VDDMAC				3.3 V		
U11-23	-	RXD5	-		P509 (ET0_RXD5-A)		
U11-24	-	RXD4	-		P508 (ET0_RXD4-A)		
U11-25	RXD3		-	RXD3	PB03 (ET0_RXD3-A / CAT0_ERXD3-A)	R140	R141
	-		RX_ER	-	PB06 (ET0_RX_ER-A / RMII0_RX_ER-A / CAT0_RX_ER-A) ^{*1}	R141	R140, R142
U11-26	RXD2		-	RXD2	PB02 (ET0_RXD2-A / CAT0_ERXD2-A)		
U11-27	RXD1				PB01 (ET0_RXD1-A / RMII0_RXD1-A / CAT0_ERXD1-A)		
U11-28	VDDMAC				3.3 V		
U11-29	RXD0				PB00 (ET0_RXD0-A / RMII0_RXD0-A / CAT0_ERXD0-A)		
U11-30	RX_DV / RX_CTL				PB05 (ET0_RX_DV-A / RMII0_CRS_DV-A / CAT0_RX_DV-A)		
U11-31	RX_ER		-	RX_ER	PB06 (ET0_RX_ER-A / RMII0_RX_ER-A / CAT0_RX_ER-A)	R142	R141
U11-32	RX_CLK		-	RX_CLK	PB04 (ET0_RX_CLK-A / RMII0_REF50CK-A / CAT0_RX_CLK-A)		R143
	-		RX_CLK	-	U11-Pin37 ^{*1} , PB04 (ET0_RX_CLK-A / RMII0_REF50CK-A / CAT0_RX_CLK-A)	R143	R138
U11-33	TX_EN / TX_CTL				PC05 (ET0_TX_EN-A / RMII0_TX_EN-A / CAT0_TX_EN-A)		
U11-34	VDD1				1.0 V		
U11-35	TX_ER		-		PC06 (ET0_TX_ER-A / CATLINKACT0) ^{*2}	J38-Pin1-2	
U11-36	MII_TXCLK		-	MII_TXCLK	PC00 (ET0_TX_CLK-A / CAT0_TX_CLK-A)		
U11-37	GTX_CLK		-		PC07 (ET0_GTX_CLK-A)	R138	R143
	-		GTX_CLK	-	U11-Pin32 ^{*1} , PB04 (ET0_RX_CLK-A / RMII0_REF50CK-A / CAT0_RX_CLK-A)	R143	R138
U11-38	TXD0				PC01 (ET0_TXD0-A / RMII0_TXD0-A / CAT0_ETXD0-A)		
U11-39	VDDMAC				3.3 V		

Ethernet PHY IC					EK-RX74M v1	Configuration	
Pin	MII	GMII	RMII	EtherCAT	Signal and destination	Closed	Open
U11-40	TXD1				PC02 (ET0_TXD1-A / RMII0_TXD1-A / CAT0_ETXD1-A)		
U11-41	TXD2		-	TXD2	PC03 (ET0_TXD2-A / CAT0_ETXD2-A)		
U11-42	TXD3		-	TXD3	PC04 (ET0_TXD3-A / CAT0_ETXD3-A)		
U11-43	-	TXD4	-		P512 (ET0_TXD4-A)		
U11-44	VDDMAC				3.3 V		
U11-45	-	TXD5	-		P513 (ET0_TXD5-A)		
U11-46	-	TXD6	-		P514 (ET0_TXD6-A)		
U11-47	-	TXD7	-		P515 (ET0_TXD7-A)		
U11-48	MDC				PG04 (ET0_MDC-A / CAT0_MDC-A) *3		
U11-49	VDDMDIO				3.3 V		
U11-50	MDIO				PG05 (ET0_MDIO-A / CAT0_MDIO-A) *3		
U11-51	MDINT			-	PG03 (ET0_INT)		
U11-52	FASTLINK_FAIL				N.C.		
U11-53	NRESET#			-	P413 *3	J44- Pin1-2	
	-			NRESET#	P000 (DSM0_CLK0-B / CATRESTOUT) *1 *3 *4	J43- Pin2-3, J44- Pin2-3	
U11-54	CLKOUT				N.C.		
U11-55	RCVRD_CLK				N.C.		
U11-56	COMA_MODE				GND		
U11-57	CLK_SQUELCH_IN				N.C.		
U11-58	VDDIO				3.3 V		
U11-59	LED1				Ethernet connector (J37 Upper Port) LED (Yellow)		
U11-60	LED0				Ethernet connector (J37 Upper Port) LED (Green), PB07 (ET0_LINKSTA / CAT0_LINKSTA)		
U11-61	REFCLK_SEL_1				GND		
U11-62	REFCLK_SEL_0				N.C. (Internal pull-up)		
U11-63	XTAL1				P304 (ETHPHYCLK / USB0_VBUSEN) *5 *6	E65	E64
U11-64	XTAL2				N.C.		
U11-65	RESERVED_1				N.C.		
U11-66	RESERVED_0				N.C.		
U11-67	REF_FILT				0.01uF to GND		
U11-68	VDD1A				1.0 V		

*1. Not connected at shipping.

*2. The signal is shared with an EtherCAT LED (LED6).

*3. The signal is shared with ET1(U12).

*4. The signal is shared with DSMIF.

*5. The signal is connected through a clock buffer (U21).

*6. The signal is shared with USB Full-Speed.

Table 32. Ethernet PHY IC (U12) Connections

Ethernet PHY IC					EK-RX74M v1	Configuration	
Pin	MII	GMII	RMII	EtherCAT	Signal and destination	Closed	Open
U12-1	REF_REXT				2kΩ to GND		
U12-2	VDD25A				2.5 V		
U12-3	-	P0_D3N	-		J37-Pin LP7 (LP_D3N)		
U12-4	-	P0_D3P	-		J37-Pin LP8 (LP_D3P)		
U12-5	VDD1A				1.0 V		
U12-6	-	P0_D2N	-		J37-Pin LP5 (LP_D2N)		
U12-7	-	P0_D2P	-		J37-Pin LP6 (LP_D2P)		
U12-8	VDD25A				2.5 V		
U12-9	P0_D1N				J37-Pin LP3 (LP_D1N)		
U12-10	P0_D1P				J37-Pin LP4 (LP_D1P)		
U12-11	VDD25A				2.5 V		
U12-12	P0_D0N				J37-Pin LP1 (LP_D0N)		
U12-13	P0_D0P				J37-Pin LP2 (LP_D0P)		
U12-14	VDD1A				1.0 V		
U12-15	THERMDA				N.C.		
U12-16	THERMDC_VSS				N.C.		
U12-17	VDD1				1.0 V		
U12-18	COL		-		PG12 (ET1_COL)		
U12-19	CRS		-		PG15 (ET1_CRS)		
U12-20	-	RXD7	-		P715 (ET1_RXD7-A)		
U12-21	-	RXD6	-		P714 (ET1_RXD6-A)		
U12-22	VDDMAC				3.3 V		
U12-23	-	RXD5	-		P713 (ET1_RXD5-A)		
U12-24	-	RXD4	-		P712 (ET1_RXD4-A)		
U12-25	RXD3		-	RXD3	P707 (ET1_RXD3-A / CAT1_ERXD3-A)	R174	R175
	-		RX_ER	-	PG02 (ET1_RX_ER-A / RMII1_RX_ER-A / CAT1_RX_ER-A) ^{*1}	R175	R174, R176
U12-26	RXD2		-	RXD2	P706 (ET1_RXD2-A / CAT1_ERXD2-A)		
U12-27	RXD1				P705 (ET1_RXD1-A / RMII1_RXD1-A / CAT1_ERXD1-A)		
U12-28	VDDMAC				3.3 V		
U12-29	RXD0				P704 (ET1_RXD0-A / RMII1_RXD0-A / CAT1_ERXD0-A)		
U12-30	RX_DV / RX_CTL				PG01 (ET1_RX_DV-A / RMII1_CRS_DV-A / CAT1_RX_DV-A)		
U12-31	RX_ER		-	RX_ER	PG02 (ET1_RX_ER-A / RMII1_RX_ER-A / CAT1_RX_ER-A)	R176	R175
U12-32	RX_CLK		-	RX_CLK	PG00 (ET1_RX_CLK-A / RMII1_REF50CK-A / CAT1_RX_CLK-A)		R177
	-		RX_CLK	-	U12-Pin37 ^{*1} , PG00 (ET1_RX_CLK-A / RMII1_REF50CK-A / CAT1_RX_CLK-A)	R177	R173
U12-33	TX_EN / TX_CTL				PA01 (ET1_TX_EN-A / RMII1_TX_EN-A / CAT1_TX_EN-A)		
U12-34	VDD1				1.0 V		
U12-35	TX_ER		-		PA07 (ET1_TX_ER-A / CATLINKACT1) ^{*2}	J39-Pin1-2	
U12-36	MII_TXCLK		-	MII_TXCLK	PA02 (ET1_TX_CLK-A / CAT1_TX_CLK-A)		
U12-37	GTX_CLK		-		PA00 (ET1_GTX_CLK-A)	R173	R177
			GTX_CLK	-	U12-Pin 32 ^{*1} , PG00 (ET1_RX_CLK-A / RMII1_REF50CK-A / CAT1_RX_CLK-A)	R177	R173
U12-38	TXD0				PA03 (ET1_TXD0-A / RMII1_TXD0-A / CAT1_ETXD0-A)		
U12-39	VDDMAC				3.3 V		

Ethernet PHY IC					EK-RX74M v1	Configuration	
Pin	MII	GMII	RMII	EtherCAT	Signal and destination	Closed	Open
U12-40	TXD1				PA04 (ET1_TXD1-A / RMII1_TXD1-A / CAT1_ETXD1-A)		
U12-41	TXD2		-	TXD2	PA05 (ET1_TXD2-A / CAT1_ETXD2-A)		
U12-42	TXD3		-	TXD3	PA06 (ET1_TXD3-A / CAT1_ETXD3-A)		
U12-43	-	TXD4	-		PG08 (ET1_TXD4-A)		
U12-44	VDDMAC				3.3 V		
U12-45	-	TXD5	-		PG09 (ET1_TXD5-A)		
U12-46	-	TXD6	-		PG10 (ET1_TXD6-A)		
U12-47	-	TXD7	-		PG11 (ET1_TXD7-A)		
U12-48	MDC				PG04 (ET0_MDC-A / CAT0_MDC-A) ^{*3}		
U12-49	VDDMDIO				3.3 V		
U12-50	MDIO				PG05 (ET0_MDIO-A / CAT0_MDIO-A) ^{*3}		
U12-51	MDINT			-	P700 (ET1_INT)		
U12-52	FASTLINK_FAIL				N.C.		
U12-53	NRESET#			-	P413 ^{*3}	J44- Pin1-2	
	-			NRESET#	P000 (DSM0_CLK0-B / CATRESTOUT) ^{*1*3*4}	J43- Pin2-3, J44- Pin2-3	
U12-54	CLKOUT				N.C.		
U12-55	RCVRD_CLK				N.C.		
U12-56	COMA_MODE				GND		
U12-57	CLK_SQUELCH_IN				N.C.		
U12-58	VDDIO				3.3 V		
U12-59	LED1				Ethernet connector (J37 Lower Port) LED (Yellow)		
U12-60	LED0				Ethernet connector (J37 Lower Port) LED (Green), P703 (ET1_LINKSTA / CAT1_LINKSTA)		
U12-61	REFCLK_SEL_1				GND		
U12-62	REFCLK_SEL_0				N.C. (Internal pull-up)		
U12-63	XTAL1				P304 (ETHPHYCLK / USB0_VBUSEN) ^{*5*6}	E65	E64
U12-64	XTAL2				N.C.		
U12-65	RESERVED_1				N.C.		
U12-66	RESERVED_0				N.C.		
U12-67	REF_FILT				0.01uF to GND		
U12-68	VDD1A				1.0 V		

*1. Not connected at shipping.

*2. The signal is shared with an EtherCAT LED (LED7).

*3. The signal is shared with ET0(U11).

*4. The signal is shared with DSMIF.

*5. The signal is connected through a clock buffer (U21).

*6. The signal is shared with USB Full-Speed.

The Ethernet connector (J37) on the EK-RX74M v1 has 4 LEDs that indicate the connection status.

Table 33. Built-in LEDs on Ethernet Connector

Built-in LEDs on Ethernet Connector (J37)			EK-RX74M v1
Pin	Color	Description ^{*1}	Signal and destination
J37-UP13	Green	Link100/1000/Activity	PB07 (ET0_LINKSTA / CAT0_LINKSTA), PHY IC (U11) LED0 pin
J37-UP11	Yellow	Link10/1000/Activity	PHY IC (U11) LED1 pin
J37-LP13	Green	Link100/1000/Activity	P703 (ET1_LINKSTA / CAT1_LINKSTA), PHY IC (U12) LED0 pin
J37-LP11	Yellow	Link10/1000/Activity	PHY IC (U12) LED1 pin

*1. These functions are in the PHY IC's default state. To change the function, refer to the PHY IC datasheet.

A 32kbit EEPROM with I²C interface (U13) is provided on the EK-RX74M v1 to save the hardware configuration for EtherCAT. A DIP SW with 8 poles (SW5) and 4 LEDs for EtherCAT to indicate connection status are also provided on the EK-RX74M v1.

Table 34. EtherCAT EEPROM Connections

EtherCAT EEPROM		EK-RX74M v1
Pin	Description	Signal
U13-1	NC	N.C.
U13-2	NC	N.C.
U13-3	NC	N.C.
U13-4	VSS	GND
U13-5	SDA	P103 (CATI2CDATA-A)
U13-6	SCL	P102 (CATI2CCLK-A)
U13-7	NC	N.C.
U13-8	VCC	3.3 V

Table 35. DIP SW for EtherCAT ID

EtherCAT ID		EK-RX74M v1
Pin	Description	Signal
SW5-1	EtherCAT_ID0	P010
SW5-2	EtherCAT_ID1	P011
SW5-3	EtherCAT_ID2	P305
SW5-4	EtherCAT_ID3	P607
SW5-5	EtherCAT_ID4	PD00
SW5-6	EtherCAT_ID5	PE00
SW5-7	EtherCAT_ID6	PF06
SW5-8	EtherCAT_ID7	PF07

Table 36. EtherCAT LED Connections

EtherCAT LED			EK-RX74M v1	Configuration	
Designator	Color	Function	Signal	Closed	Open
LED6	Green	Link / Activity (EtherCAT IN)	PC06 (ET0_TX_ER-A / CATLINKACT0)*1*2	J38-Pin2-3	
LED7	Green	Link / Activity (EtherCAT OUT)	PA07 (ET1_TX_ER-A / CATLINKACT1)*1*3	J39-Pin2-3	
LED8	Green	Run	P502 (CATLEDRUN)		
LED9	Red	Error	P503 (CATLEDERR)		

*1. Not connected at shipping.

*2. The signal is shared with ET0 (U11).

*3. The signal is shared with ET1 (U12).

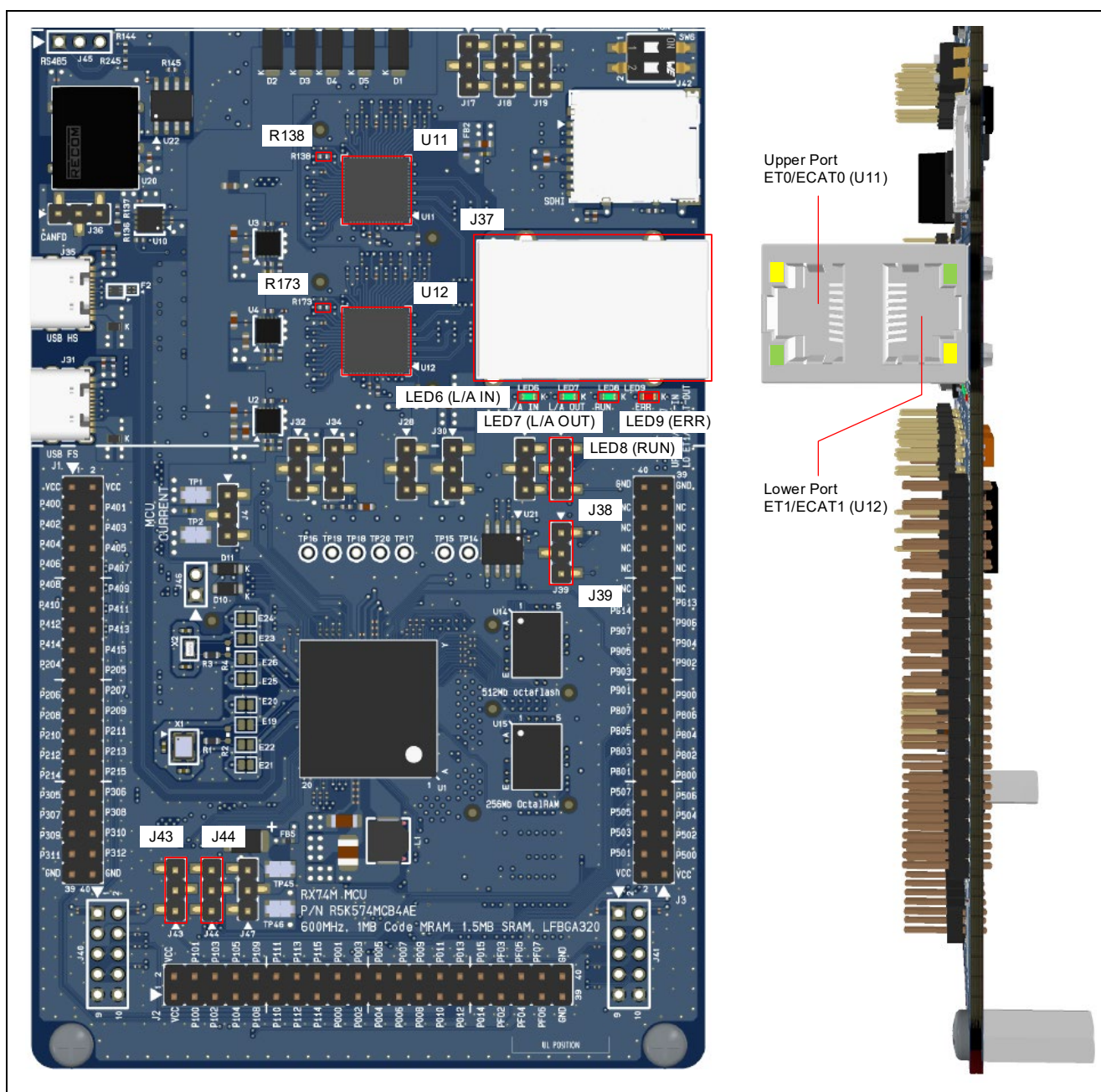


Figure 37. Ethernet System (top side)

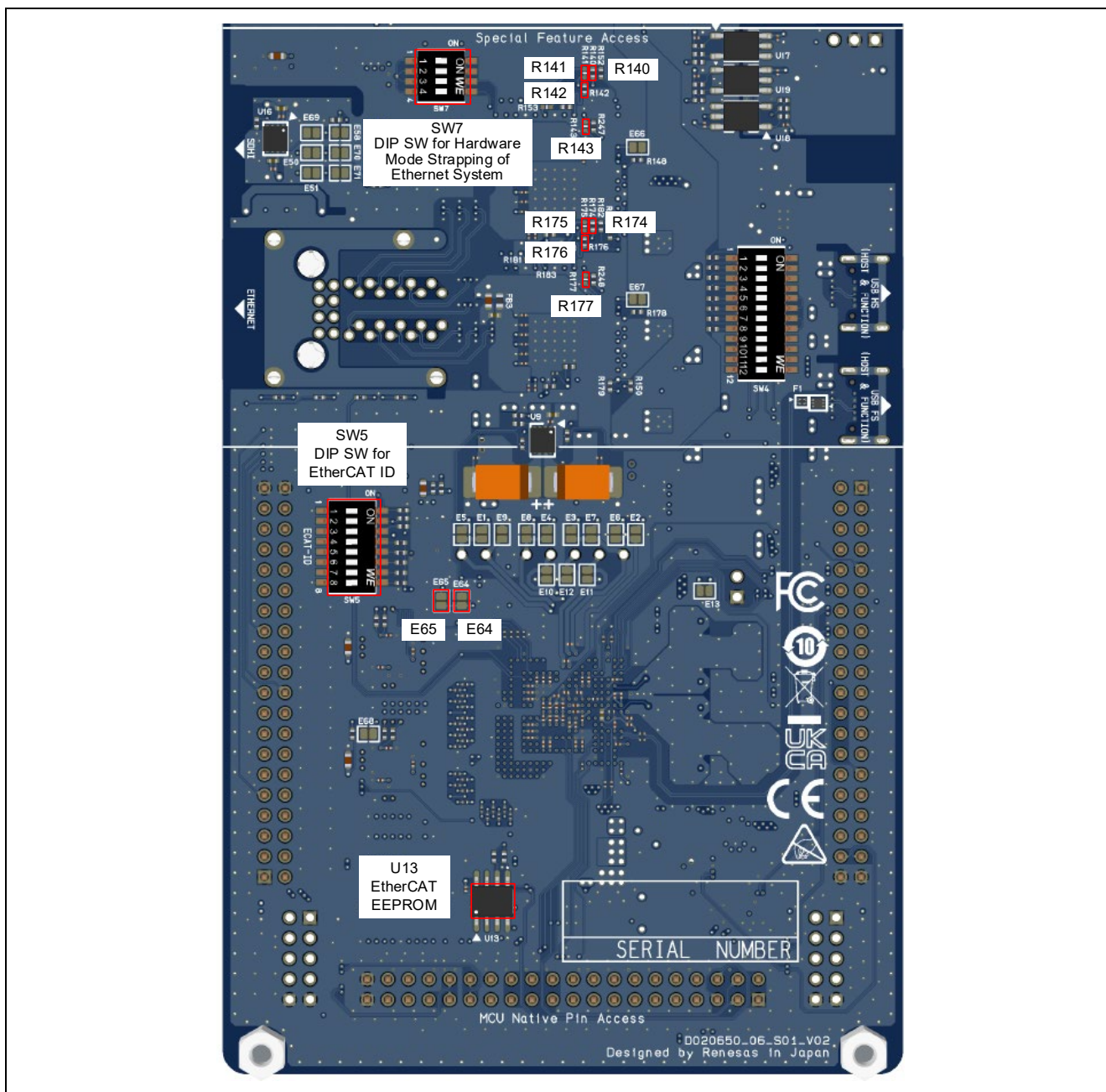


Figure 38. Ethernet System (bottom side)

6.4 OctaFlash

Included on the EK-RX74M v1 is a 512 Mbit (64MB) OctaFlash (MX25LW51245GXDI00). The OctaFlash (U14) is connected to XSPI incorporated in the RX MCU.

When the OctaFlash (MX25LW51245GXDI00) is used together with the RX MCU, the OctaFlash can be accessed directly through the memory-mapped address space without using the XSPI Command Map Control register (CMCTLCH0) in the RX MCU.

Table 37. OctaFlash Connections

OctaFlash		EK-RX74M v1
Pin	Description	Signal
U14-A2	NC	N.C.
U14-A3	NC	N.C.
U14-A4	RESET#	P606 (XSPI0_RESET0#)
U14-A5	ECS#	P605 (XSPI0_INT0# / XSPI0_ECS0#)
U14-B1	DNU	N.C.
U14-B2	SCLK	PD01 (XSPI0_CK)
U14-B3	GND	GND
U14-B4	VCC	3.3 V
U14-B5	DNU	N.C.
U14-C1	VSSQ	GND
U14-C2	CS#	PD07 (XSPI0_CS0#)
U14-C3	DQS	PD06 (XSPI0_DS)
U14-C4	SIO2	PD04 (XSPI0_IO2)
U14-C5	NC	N.C.
U14-D1	VCCQ	3.3 V
U14-D2	SIO1	PD03 (XSPI0_IO1)
U14-D3	SIO0	PD02 (XSPI0_IO0)
U14-D4	SIO3	PD05 (XSPI0_IO3)
U14-D5	SIO4	P600 (XSPI0_IO4)
U14-E1	SIO7	P603 (XSPI0_IO7)
U14-E2	SIO6	P602 (XSPI0_IO6)
U14-E3	SIO5	P601 (XSPI0_IO5)
U14-E4	VCCQ	3.3 V
U14-E5	VSSQ	GND

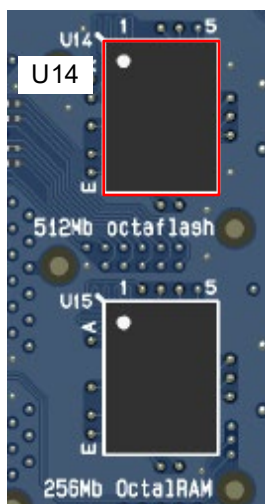


Figure 39. OctaFlash

6.4.1 OctaFlash Read / Write Byte Order

The MX25LW51245GXDI00 flash device uses the byte order shown below (taken from the Macronix MX25LW51245G data sheet) when writing or reading data in DOPI mode.

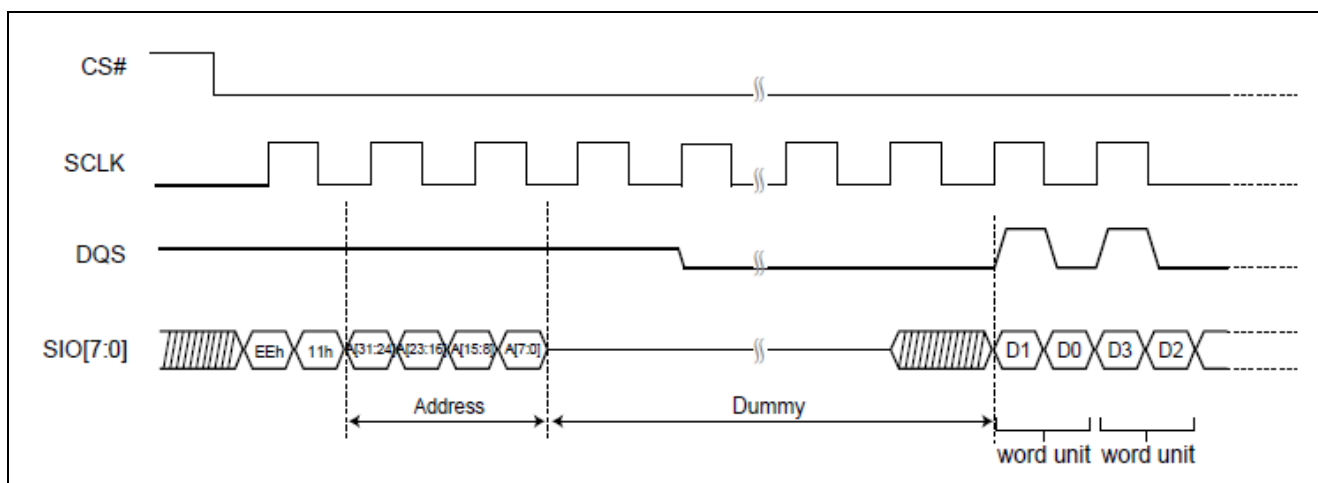


Figure 40. OctaFlash Read Write Byte Order in DOPI mode

This order (D1, D0, D3, D2 ...) differs from the order that is used when reading or writing data in SPI mode (D0, D1, D2, D3, ...). The mode used for reading data must be the same as the mode used for writing data therefore, this must be taken into consideration.

6.5 OctalRAM

Included on the EK-RX74M v1 is a 256 Mbit (32MB) OctalRAM (IS66WVO32M8DBLL-166BLI). The OctalRAM device (U15) is connected to XSPI incorporated in the RX MCU.

Table 38. OctalRAM Connections

OctalRAM		EK-RX74M v1
Pin	Description	Signal
U15-A2	NC	N.C.
U15-A3	CS#	PE07 (XSPI1_CS0#)
U15-A4	RESET#	PF08 (XSPI1_RESET0#)
U15-A5	RFU	N.C.
U15-B1	RFU	N.C.
U15-B2	SCLK	PE01 (XSPI1_CK)
U15-B3	VSS	GND
U15-B4	VCC	3.3 V
U15-B5	RFU	N.C.
U15-C1	VSSQ	GND
U15-C2	RFU	N.C.
U15-C3	DQSM	PE06 (XSPI1_DS)
U15-C4	SIO2	PE04 (XSPI1_IO2)
U15-C5	RFU	N.C.
U15-D1	VCCQ	3.3 V
U15-D2	SIO1	PE03 (XSPI1_IO1)
U15-D3	SIO0	PE02 (XSPI1_IO0)
U15-D4	SIO3	PE05 (XSPI1_IO3)
U15-D5	SIO4	P708 (XSPI1_IO4)
U15-E1	SIO7	P711 (XSPI1_IO7)
U15-E2	SIO6	P710 (XSPI1_IO6)
U15-E3	SIO5	P709 (XSPI1_IO5)
U15-E4	VCCQ	3.3 V
U15-E5	VSSQ	GND

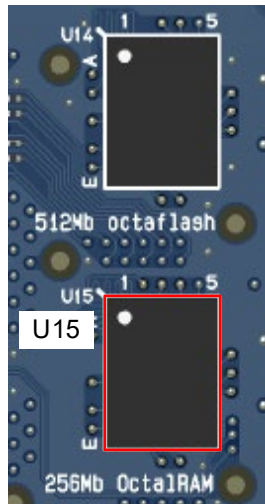


Figure 41. OctalRAM

6.6 RS-485

An RS-485 transceiver (U22) is provided on the EK-RX74M v1 and connected to RSCI incorporated in the RX MCU. The RS-485 transceiver supports half duplex communication.

The RS-485 is isolated from other functions by an isolated DC/DC converter (U20) and photocouplers (U17, U18 and U19). The maximum baud rate is limited to 15 Mbps because of the photocouplers.

Table 39. RS-485 transceiver IC and RX MCU Connections

RS-485 transceiver		EK-RX74M v1
Pin	Description	Signal
U22-1	RO	P800 (RXD010-B)
U22-2	RE#	P803 (DE010)
U22-3	DE	
U22-4	DI	P801 (TXD010-B)
U22-5	GND	RS485_GND
U22-6	A/Y	RS485_AY
U22-7	B/Z	RS485_BZ
U22-8	VCC	RS485_3.3V

The differential signals of RS485_AY and RS485_BZ are connected to RS-485 interface connector J45 (3-pin male header, not fitted).

Table 40. RS-485 Connections

RS-485 Interface Connector	EK-RX74M v1
Pin	Signal
J45-1	RS485_BZ
J45-2	GND
J45-3	RS485_AY

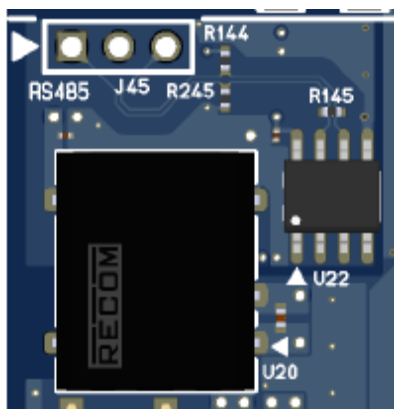


Figure 42. RS-485

6.7 SD/MMC Host Interface (SDHI)

The microSD card slot (J42) connects to the RX MCU SD/MMC Host Interface (SDHIA). It supports communication for testing and evaluating RX MCU firmware. For more information about the SD/MMC Host Interface specification, see *RX74M Group User's Manual: Hardware*.

SWITCH_A and SWITCH_B are pins of a card detection switch in the microSD card slot. The connection between them closes when a microSD card is inserted into the card slot.

Power (+3V3_SD) to the microSD card is supplied from U16 (SDHI Power Control IC). Configure the RX MCU firmware according to [Table 42](#) to enable U16 and monitor overcurrent detection of U16.

Note: The EK-RX74M v1 supports default and high-speed mode.

Table 41. SDHI Connections

microSD Card Slot		EK-RX74M v1	Configuration	
Designator	Description	Signal	Closed	Open
J42-1	DAT2	P106 (SD0_DAT2-C)		
J42-2	DAT3 / CD	P107 (SD0_DAT3-C)		
J42-3	CMD	P200 (SD0_CMD-C)		
J42-4	VDD	+3V3_SD		
J42-5	CLK	P201 (SD0_CLK-C)		
J42-6	VSS	GND		
J42-7	DAT0	P202 (SD0_DAT0-C / SCL00-B) *1 *2	E70	E50
J42-8	DAT1	P203 (SD0_DAT1-C / SDA00-B) *1 *2	E71	E51
J42-9	SWITCH_B	GND		
J42-10	SWITCH_A	P205 (SD0_CD / USBHS_VBUSEN) *1 *3	J48-Pin2-3	

*1. Not connected at shipping.

*2. The signals are shared with Grove 1 and Pmod 1.

*3. The signal is shared with USB High-Speed.

Table 42. SDHI Power Control IC

U16 SDHI Power Control IC		EK-RX74M v1	Configuration	
Designator	Description	Signal	Closed	Open
U16-3	+3V3_SD supply enable signal	P701		
U16-8	Overcurrent detection signal	P501 (IRQ1) *1	E69	E58

*1. The signal is shared with mikroBUS.

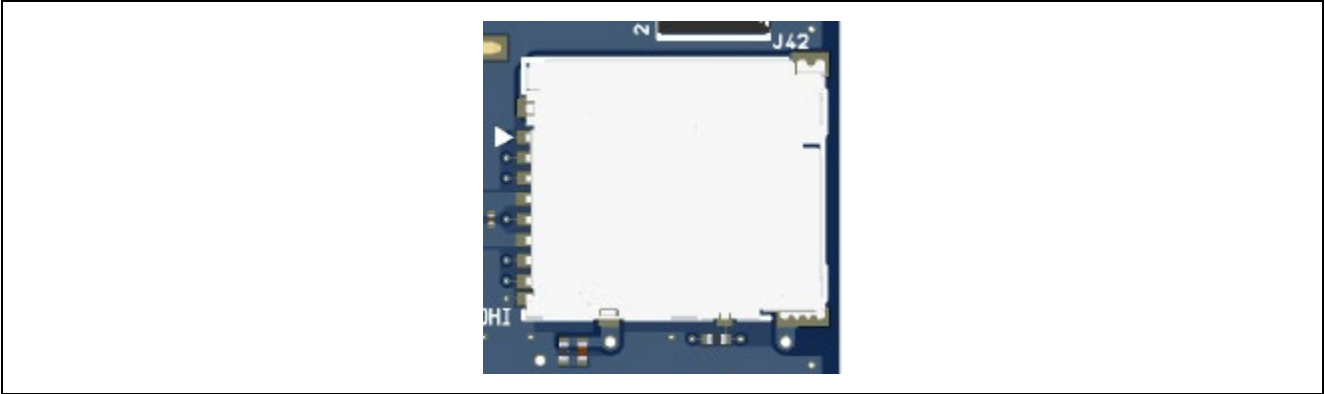


Figure 43. microSD Card Slot

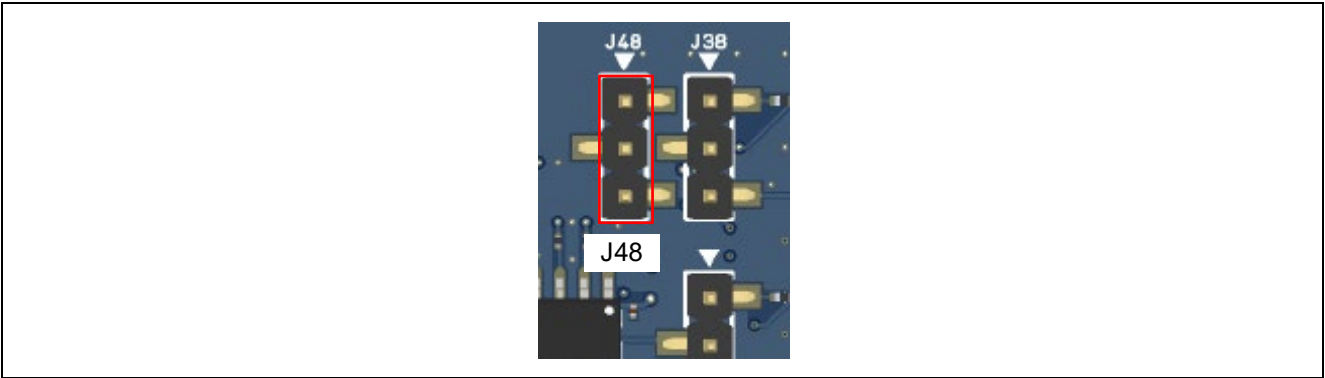


Figure 44. SDHI Pin Header

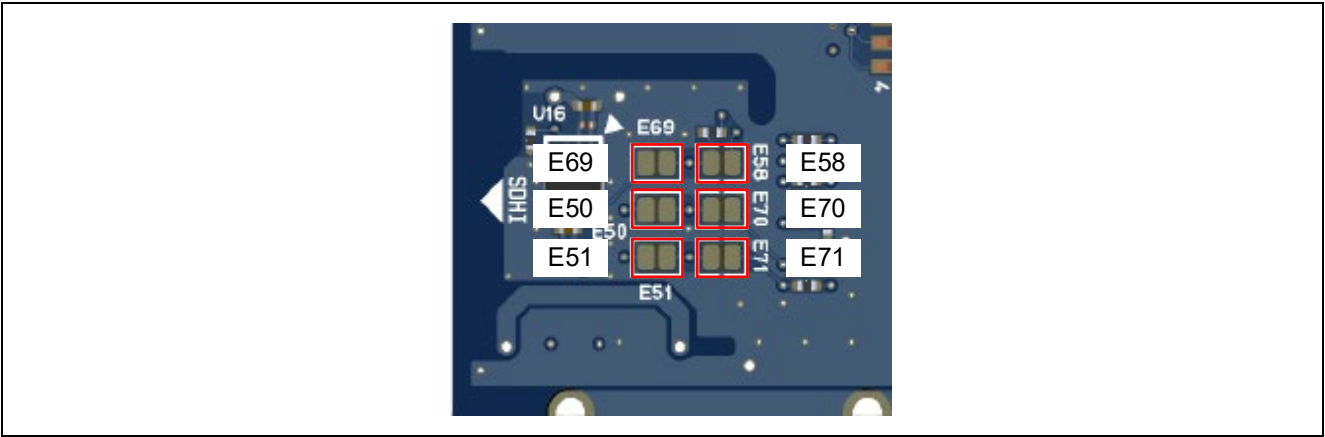


Figure 45. SDHI Copper jumpers (bottom side)

6.8 USB High-Speed

The USB Type-C connector (J35) connects the RX MCU USB High-Speed interface to an external USB interface. It supports communications for testing and use of the RX MCU firmware. This connection can be configured as either a USB Function or a USB Host interface.

The USB Function mode can be configured as either bus-powered (As described in section 5.1, the EK-RX74M v1 has multiple input power sources in addition to this VBUS) or self-powered mode. To configure USB function mode (bus-powered or self-powered):

- Configure the jumpers and DIP switches as shown in [Table 44](#).
- Configure the RX MCU firmware for USB high-speed function mode.

An external USB host connected to the USB Type-C connector can provide power to the EK-RX74M v1.

For the USB Host configuration, set the jumpers and DIP switch according to [Table 44](#), and configure the RX MCU firmware to operate the USB High-Speed ports in Host mode. In this configuration, U9 (the power control IC) controls the USB power output and supplies 5 V / 500 mA to the connected USB function device. Configure the RX MCU firmware according to [Table 45](#) to enable U9 and monitor its overcurrent detection function.

NOTE: Ensure that the input power sources provide sufficient power for both the EK-RX74M v1 and the USB High-Speed port operating in Host mode.

DIP SW (SW4) which controls voltage of CC pins (J35-Pin A5 and B5) of the USB Type-C connector (J35) is provided on the EK-RX74M v1. [Table 44](#) shows configuration of the DIP SW at the host mode and the function mode.

Table 43. USB High-Speed Connections

USB High-Speed Connector		EK-RX74M v1
Pin	Description	Signal
J35-A4/B9	VBUS	+5V_USBHS (Function Mode) +5V_H_USBHS (Host Mode)
J35-A9/B4	VBUS	+5V_USBHS (Function Mode) +5V_H_USBHS (Host Mode)
J35-A5	CC1	Refer to Table 44
J35-B5	CC2	Refer to Table 44
J35-A6	D+1	USBHS_DP
J35-B6	D+2	USBHS_DP
J35-A7	D-1	USBHS_DM
J35-B7	D-2	USBHS_DM
J35-A8	SBU1	N.C.
J35-B8	SBU2	N.C.
J35-A1/B12	GND	GND
J35-A12/B1	GND	GND

Table 44. USB High-Speed Pin Header Jumper and DIP SW (SW4) Configuration

USB Operating Mode		J32	J34	SW4 *1
Host Mode		Open	Jumper on pins 1-2	Pin1 ON, Pin3 ON, Pin9 ON, Pin10 ON, Pin2 OFF, Pin4 OFF
Function Mode	Bus-power	Jumper on pins 1-2	Jumper on pins 2-3	Pin1 OFF, Pin3 OFF, Pin9 OFF, Pin10 OFF, Pin2 ON, Pin4 ON
	Self-power	Open	Jumper on pins 2-3	

1. Refer to [Figure 27](#) for the appearance of SW4 (DIP SW).

Note: When using the USB Function mode, if power is supplied to the EK-RX74M v1 while SW4-Pin 9, 10 are set to ON, the USB CC voltage will be temporarily applied to the RX MCU while it is inactive. To prevent potential damage to the RX MCU, ensure that these settings are switched to OFF before supplying power.

Table 45. USB High-Speed Power Control IC

U9 USB High-Speed Power Control IC		EK-RX74M v1	Configuration	
Signal	Function	Signal	Closed	Open
USBHS_VBUSEN	VBUS supply enable	P205 (USBHS_VBUSEN / SD0_CD) *1	J48-Pin1-2	
USBHS_OVRCURA-DS	Overcurrent detection	P206 (USBHS_OVRCURA-DS)		

*1. The signal is shared with SDHI.

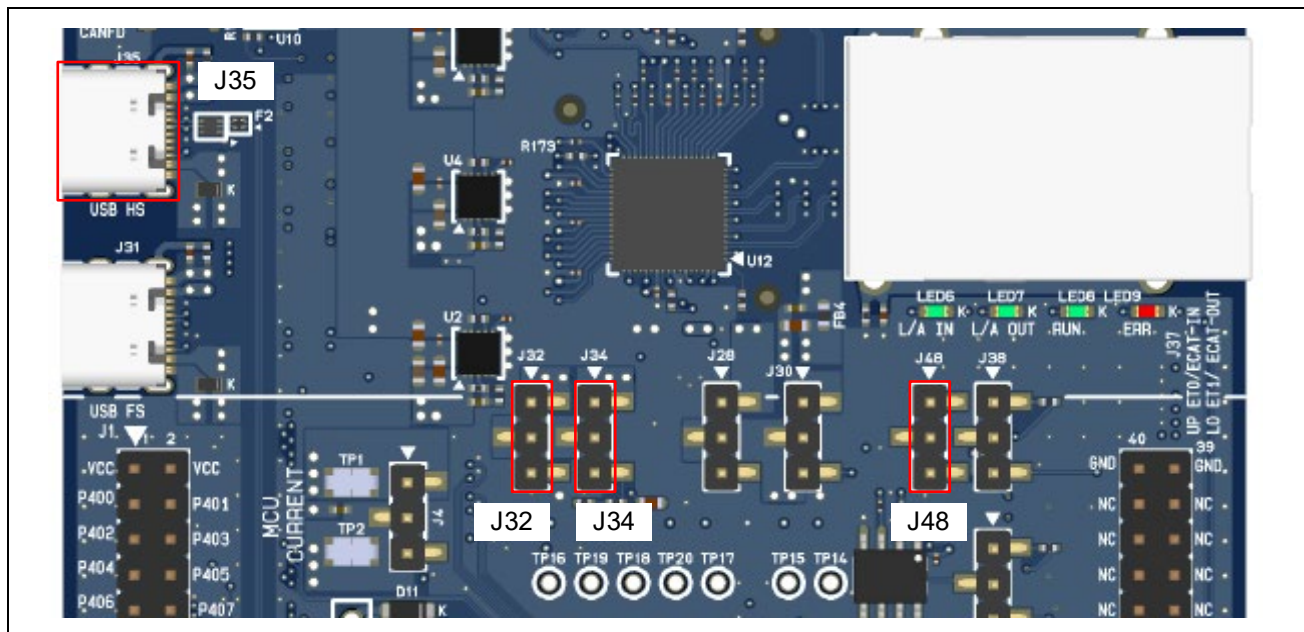


Figure 46. USB High-Speed Connector and Pin Headers

Figure 47. MCU Native Pin Access Area

The EK-RX74M v1 pin headers, J1, J2 and J3, provide access to RX MCU signals. Each header pin is labeled with the power or port connected to that pin. Refer to the *RX74M Group User's Manual: Hardware* for details of each port function, and the EK-RX74M v1 schematic for pin header port assignments.

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

7.2 MCU and USB Current Measurement

The Native Pin Access area includes current measurement test points to measure the RX MCU current and MCU USB controller current.

The EK-RX74M v1 provides:

- 2 test points (TP1 and TP2) for current measurement of the main 3.3 V MCU power
- 2 test points (TP45 and TP46) for current measurement of the USB module incorporated in the RX MCU.

Remove the shunt jumper from J4. Connect an ammeter between TP1 and TP2 to measure the RX MCU power current.

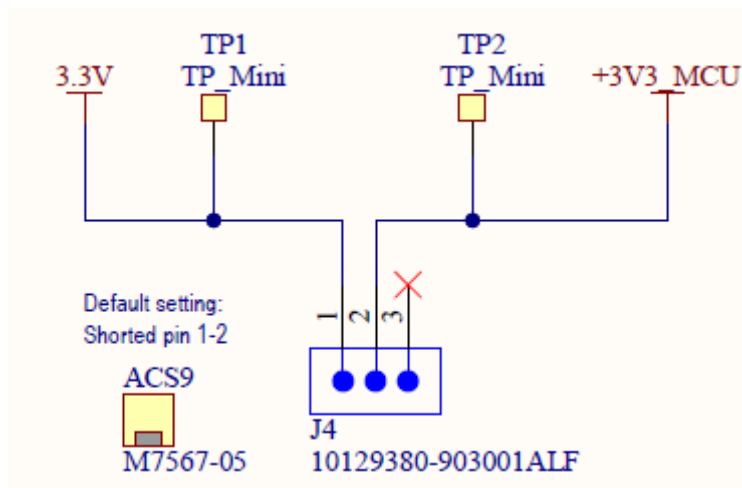


Figure 48. RX MCU Current Measurement Circuit

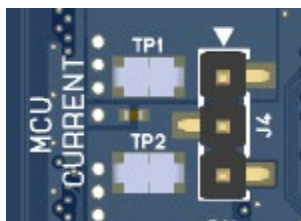


Figure 49. Pin Header Jumper J4

Remove the shunt jumper from J47. Connect an ammeter between TP45 and TP46 to measure the MCU's USB power current.

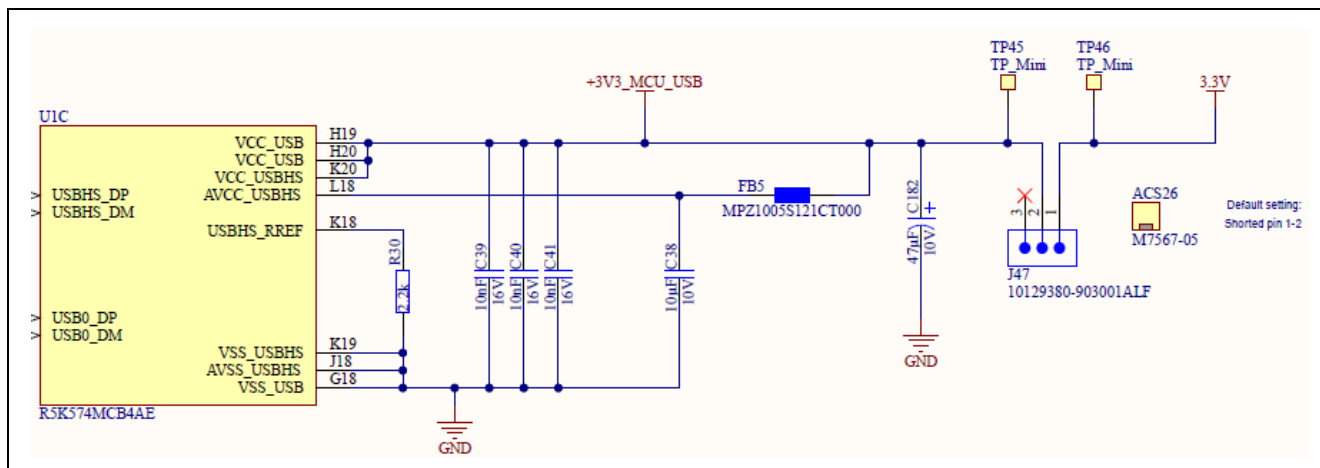


Figure 50. MCU's USB Current Measurement Circuit

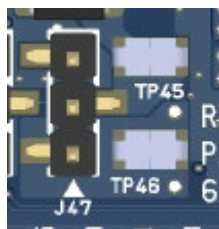


Figure 51. Pin Header Jumper J47

8. Recommended Components

[Table 46](#) lists recommended part numbers for the components that can be fitted as required.

Table 46. Recommended Components

Designator(s)	Description	Manufacturer	Part Number
C58 *1	Noise suppression capacitor for hot plug in.	-	The capacitance must be adjusted by users.
J22, J23	Seeed Grove Connector	Seeed Studio	110990037
J24	SparkFun Qwiic Connector	JST	SM04B-SRSS-TB(LF)(SN)
J40, J41	DSMIF Connector	Würth Electronics	61301021821
J45	RS-485 Connector	Würth Electronics	61300311121
J46	Connector to RX MCU VBATT pin for external Power supplier	Würth Electronics	61300211121

*1. 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, raise time of RES# must be satisfied. The EK-RX74M v1 provides pads of chip capacitance (size 0402 (inch)).

9. Certifications

The EK-RX74M v1 meets the following certifications/standards. See “[Renesas EK-RX74M Disclaimer](#)” and “[Precautions](#)” of this user’s manual for the disclaimer and precautions.

9.1 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: CNS 15936, Class A limits 警告：為避免電磁干擾，本產品不應安裝或使用於住宅環境
- Australia/New Zealand AS/NZS CISPR 32:2015, Class A

9.2 Material Selection, Waste, Recycling and Disposal Standards

- EU RoHS
- China SJ/T 113642014, 10-year environmental protection use period.
- WEEE Directive (2012/19/EU) & The Waste Electrical and Electronic Equipment Regulations 2013



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 UK and European Union.

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;
<https://www.renesas.com/eu/en/support/regional-customer-support/weee>

9.3 Safety Standards

- UL 94V-0

10. Design and Manufacturing Information

The design and manufacturing information for the EK-RX74M v1 is available in the “EK-RX74M v1 Design Package” available on renesas.com/ek-rx74m.

- Design package file name: ek-rx74m-v1-designpackage.zip
- Design package contents

Table 47. EK-RX74M v1 Design Package Contents

File Type	Content	File / Folder Name
File (PDF)	Schematics	ek-rx74m-v1-schematics
File (PDF)	Mechanical Drawing	ek-rx74m-v1-mechdwg
File (PDF)	3D Drawing	ek-rx74m-v1-3d
File (EXCEL)	BoM	ek-rx74m-v1-bom
Folder	Manufacturing Files	Manufacturing Files
File (ZIP)	Design Files	Design Files-Altium

11. 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-RX74M Resources	renesas.com/ek-rx74m
RX Kit Information	renesas.com/rx/kits
RX Product Information	renesas.com/rx
RX Product Support Forum	renesas.com/rx/forum
RX Videos	renesas.com/rx/videos
RX Kit Feedback and Feature Request	renesas.com/rx/kitfeedback
Renesas Support	renesas.com/support

Revision History

Rev.	Date	Description	
		Page	Summary
1.00	Sep.28.26	—	Initial release

EK-RX74M v1 – User's Manual

Publication Date: Sep.28.26 Rev.1.00

Published by: Renesas Electronics Corporation

EK-RX74M v1 – User's Manual