RA6M5 Group

Cloud Kit for RA6M5 Microcontroller Group CK-RA6M5 v1 with RYZ014A Pmod User's Manual

Renesas RA Family

RA6 Series

All information contained in these materials, including products and product specifications, represents information on the product at the time of publication and is subject to change by Renesas Electronics Corp. without notice. Please review the latest information published by Renesas Electronics Corp. through various means, including the Renesas Electronics Corp. website (http://www.renesas.com).

Renesas Electronics
www.renesas.com

Rev. 3.10 Jan 2023

Notice

1. Descriptions of circuits, software and other related information in this document are provided only to illustrate the operation of semiconductor products and application examples. You are fully responsible for the incorporation or any other use of the circuits, software, and information in the design of your product or system. Renesas Electronics disclaims any and all liability for any losses and damages incurred by you or third parties arising from the use of these circuits, software, or information.

2. Renesas Electronics hereby expressly disclaims any warranties against and liability for infringement or any other claims involving patents, copyrights, or other intellectual property rights of third parties, by or arising from the use of Renesas Electronics products or technical information described in this document, including but not limited to, the product data, drawings, charts, programs, algorithms, and application examples.

3. No license, express, implied or otherwise, is granted hereby under any patents, copyrights or other intellectual property rights of Renesas Electronics or others.

4. You shall be responsible for determining what licenses are required from any third parties, and obtaining such licenses for the lawful import, export, manufacture, sales, utilization, distribution or other disposal of any products incorporating Renesas Electronics products, if required.

5. You shall not alter, modify, copy, or reverse engineer any Renesas Electronics product, whether in whole or in part. Renesas Electronics disclaims any and all liability for any losses or damages incurred by you or third parties arising from such alteration, modification, copying or reverse engineering.

6. Renesas Electronics products are classified according to the following two quality grades: "Standard" and "High Quality". The intended applications for each Renesas Electronics product depends on the product's quality grade, as indicated below.

    "Standard": Computers; office equipment; communications equipment; test and measurement equipment; audio and visual equipment; home electronic appliances; machine tools; personal electronic equipment; industrial robots; etc.

    "High Quality": Transportation equipment (automobiles, trains, ships, etc.); traffic control (traffic lights); large-scale communication equipment; key financial terminal systems; safety control equipment; etc.

    Unless expressly designated as a high reliability product or a product for harsh environments in a Renesas Electronics data sheet or other Renesas Electronics document, Renesas Electronics products are not intended or authorized for use in products or systems that may pose a direct threat to human life or bodily injury (artificial life support devices or systems; surgical implantations; etc.), or may cause serious property damage (space system; undersea repeaters; nuclear power control systems; aircraft control systems; key plant systems; military equipment; etc.). Renesas Electronics disclaims any and all liability for any damages or losses incurred by you or any third parties arising from the use of any Renesas Electronics product that is inconsistent with any Renesas Electronics data sheet, user's manual or other Renesas Electronics document.

7. No semiconductor product is absolutely secure. Notwithstanding any security measures or features that may be implemented in Renesas Electronics hardware or software products, Renesas Electronics shall have absolutely no liability arising out of any vulnerability or security breach, including but not limited to any unauthorized access to or use of a Renesas Electronics product or a system that uses a Renesas Electronics product. RENESAS ELECTRONICS DOES NOT WARRANT OR GUARANTEE THAT RENESAS ELECTRONICS PRODUCTS, OR ANY SYSTEMS CREATED USING RENESAS ELECTRONICS PRODUCTS WILL BE INVULNERABLE OR FREE FROM CORRUPTION, ATTACK, VIRUSES, INTERFERENCE, HACKING, DATA LOSS OR THEFT, OR OTHER SECURITY INTRUSION ("Vulnerability Issues"). RENESAS ELECTRONICS DISCLAIMS ANY AND ALL RESPONSIBILITY OR LIABILITY ARISING FROM OR RELATED TO ANY VULNERABILITY ISSUES. FURTHERMORE, TO THE EXTENT PERMITTED BY APPLICABLE LAW, RENESAS ELECTRONICS DISCLAIMS ANY AND ALL WARRANTIES, EXPRESS OR IMPLIED, WITH RESPECT TO THIS DOCUMENT AND ANY RELATED OR ACCOMPANYING SOFTWARE OR HARDWARE, INCLUDING BUT NOT LIMITED TO THE IMPLIED WARRANTIES OF MERCHANTABILITY, OR FITNESS FOR A PARTICULAR PURPOSE.

8. When using Renesas Electronics products, refer to the latest product information (data sheets, user's manuals, application notes, "General Notes for Handling and Using Semiconductor Devices" in the reliability handbook, etc.), and ensure that usage conditions are within the ranges specified by Renesas Electronics with respect to maximum ratings, operating power supply voltage range, heat dissipation characteristics, installation, etc. Renesas Electronics disclaims any and all liability for any malfunctions, failure or accident arising out of the use of Renesas Electronics products outside of such specified ranges.

9. Although Renesas Electronics endeavors to improve the quality and reliability of Renesas Electronics products, semiconductor products have specific characteristics, such as the occurrence of failure at a certain rate and malfunctions under certain use conditions. Unless designated as a high reliability product or a product for harsh environments in a Renesas Electronics data sheet or other Renesas Electronics document, Renesas Electronics products are not subject to radiation resistance design. You are responsible for implementing safety measures to guard against the possibility of bodily injury, injury or damage caused by fire, and/or danger to the public in the event of a failure or malfunction of Renesas Electronics products, such as safety design for hardware and software, including but not limited to redundancy, fire control and malfunction prevention, appropriate treatment for aging degradation or any other appropriate measures. Because the evaluation of microcomputer software alone is very difficult and impractical, you are responsible for evaluating the safety of the final products or systems manufactured by you.

10. Please contact a Renesas Electronics sales office for details as to environmental matters such as the environmental compatibility of each Renesas Electronics product. You are responsible for carefully and sufficiently investigating applicable laws and regulations that regulate the inclusion or use of controlled substances, including without limitation, the EU RoHS Directive, and using Renesas Electronics products in compliance with all these applicable laws and regulations. Renesas Electronics disclaims any and all liability for damages or losses occurring as a result of your noncompliance with applicable laws and regulations.

11. Renesas Electronics products and technologies shall not be used for or incorporated into any products or systems whose manufacture, use, or sale is prohibited under any applicable domestic or foreign laws or regulations. You shall comply with any applicable export control laws and regulations promulgated and administered by the governments of any countries asserting jurisdiction over the parties or transactions.

12. It is the responsibility of the buyer or distributor of Renesas Electronics products, or any other party who distributes, disposes of, or otherwise sells or transfers the product to a third party, to notify such third party in advance of the contents and conditions set forth in this document.

13. This document shall not be reprinted, reproduced or duplicated in any form, in whole or in part, without prior written consent of Renesas Electronics.

14. Please contact a Renesas Electronics sales office if you have any questions regarding the information contained in this document or Renesas Electronics products.

(Note1) "Renesas Electronics" as used in this document means Renesas Electronics Corporation and also includes its directly or indirectly controlled subsidiaries.

(Note2) "Renesas Electronics product(s)" means any product developed or manufactured by or for Renesas Electronics.

(Rev.5.0-1 October 2020)

Corporate Headquarters

TOYOSU FORESIA, 3-2-24 Toyosu,
Koto-ku, Tokyo 135-0061, Japan

www.renesas.com

Trademarks

Renesas and the Renesas logo are trademarks of Renesas Electronics Corporation. All trademarks and registered trademarks are the property of their respective owners.

Contact information

For further information on a product, technology, the most up-to-date version of a document, or your nearest sales office, please visit:
www.renesas.com/contact/.

General Precautions in the Handling of Microprocessing Unit and Microcontroller Unit Products

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

1. Precaution against Electrostatic Discharge (ESD)

   A strong electrical field, when exposed to a CMOS device, can cause destruction of the gate oxide and ultimately degrade the device operation. Steps must be taken to stop the generation of static electricity as much as possible, and quickly dissipate it when it occurs. Environmental control must be adequate. When it is dry, a humidifier should be used. This is recommended to avoid using insulators that can easily build up static electricity. Semiconductor devices must be stored and transported in an anti-static container, static shielding bag or conductive material. All test and measurement tools including work benches and floors must be grounded. The operator must also be grounded using a wrist strap. Semiconductor devices must not be touched with bare hands. Similar precautions must be taken for printed circuit boards with mounted semiconductor devices.

2. Processing at power-on

   The state of the product is undefined at the time when power is supplied. The states of internal circuits in the LSI are indeterminate and the states of register settings and pins are undefined at the time when power is supplied. In a finished product where the reset signal is applied to the external reset pin, the states of pins are not guaranteed from the time when power is supplied until the reset process is completed. In a similar way, the states of pins in a product that is reset by an on-chip power-on reset function are not guaranteed from the time when power is supplied until the power reaches the level at which resetting is specified.

3. Input of signal during power-off state

   Do not input signals or an I/O pull-up power supply while the device is powered off. The current injection that results from input of such a signal or I/O pull-up power supply may cause malfunction and the abnormal current that passes in the device at this time may cause degradation of internal elements. Follow the guideline for input signal during power-off state as described in your product documentation.

4. Handling of unused pins

   Handle unused pins in accordance with the directions given under handling of unused pins in the manual. The input pins of CMOS products are generally in the high-impedance state. In operation with an unused pin in the open-circuit state, extra electromagnetic noise is induced in the vicinity of the LSI, an associated shoot-through current flows internally, and malfunctions occur due to the false recognition of the pin state as an input signal become possible.

5. Clock signals

   After applying a reset, only release the reset line after the operating clock signal becomes stable. When switching the clock signal during program execution, wait until the target clock signal is stabilized. When the clock signal is generated with an external resonator or from an external oscillator during a reset, ensure that the reset line is only released after full stabilization of the clock signal. Additionally, when switching to a clock signal produced with an external resonator or by an external oscillator while program execution is in progress, wait until the target clock signal is stable.

6. Voltage application waveform at input pin

   Waveform distortion due to input noise or a reflected wave may cause malfunction. If the input of the CMOS device stays in the area between V_{IL} (Max.) and V_{IH} (Min.) due to noise, for example, the device may malfunction. Take care to prevent chattering noise from entering the device when the input level is fixed, and also in the transition period when the input level passes through the area between V_{IL} (Max.) and V_{IH} (Min.).

7. Prohibition of access to reserved addresses

   Access to reserved addresses is prohibited. The reserved addresses are provided for possible future expansion of functions. Do not access these addresses as the correct operation of the LSI is not guaranteed.

8. Differences between products

   Before changing from one product to another, for example to a product with a different part number, confirm that the change will not lead to problems. The characteristics of a microprocessing unit or microcontroller unit products in the same group but having a different part number might differ in terms of internal memory capacity, layout pattern, and other factors, which can affect the ranges of electrical characteristics, such as characteristic values, operating margins, immunity to noise, and amount of radiated noise. When changing to a product with a different part number, implement a system-evaluation test for the given product.

Renesas CK-RA6M5 Disclaimer

By using this CK-RA6M5, the User accepts the following terms, which are in addition to, and control in the event of disagreement, with Renesas' General Terms and Conditions available at renesas.com/legal-notices.

The CK-RA6M5 is not guaranteed to be error free, and the entire risk as to the results and performance of the CK-RA6M5 is assumed by the User. The CK-RA6M5 is provided by Renesas on an "as is" basis without warranty of any kind whether express or implied, including but not limited to the implied warranties of good workmanship, fitness for a particular purpose, title, merchantability, and non-infringement of intellectual property rights. Renesas expressly disclaims any implied warranty.

Renesas does not consider the CK-RA6M5 to be a finished product and therefore the CK-RA6M5 may not comply with some requirements applicable to finished products, including, but not limited to recycling, restricted substances and electromagnetic compatibility regulations. Refer to Certifications section, for information about certifications and compliance information for the CK-RA6M5. It is the kit User's responsibility to make sure the kit meets any local requirements applicable to their region.

Renesas or its affiliates shall in no event be liable for any loss of profit, loss of data, loss of contract, loss of business, damage to reputation or goodwill, any economic loss, any reprogramming or recall costs (whether the foregoing losses are direct or indirect) nor shall Renesas or its affiliates be liable for any other direct or indirect special, incidental or consequential damages arising out of or in relation to the use of this CK-RA6M5, even if Renesas or its affiliates have been advised of the possibility of such damages.

Renesas has used reasonable care in preparing the information included in this document, but Renesas does not warrant that such information is error free nor does Renesas guarantee an exact match for every application or parameter to part numbers designated by other vendors listed herein. The information provided in this document is intended solely to enable the use of Renesas products. No express or implied license to any intellectual property right is granted by this document or in connection with the sale of Renesas products. Renesas reserves the right to make changes to specifications and product descriptions at any time without notice. Renesas assumes no liability for any damages incurred by you resulting from errors in or omissions from the information included herein. Renesas cannot verify, and assumes no liability for, the accuracy of information available on another company's website.

Precautions

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

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

• Ensure attached cables do not lie across the equipment.

• Reorient the receiving antenna.

• Increase the distance between the equipment and the receiver.

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

• Power down the equipment when not in use.

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

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

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

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

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

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

Renesas RA Family

CK-RA6M5 v1 with RYZ014A Pmod

Contents

Figures

Tables

Glossary

Table 1. List of Abbreviations and Acronyms

BoM	Bill of Materials
CK	Cloud Kit
ETM	Embedded Trace Module
FSP	Flexible Software Package
GPIO	General Purpose Input Output
I²C (or IIC)	Inter-Integrated Circuit
IDE	Integrated Development Environment
I/O	Input/Output
IRQ	Interrupt Request
LDO	Low Dropout
LED	Light Emitting Diode
LQFP	Low-profile Quad Flat Pack
MCU	Micro Controller Unit
MEMS	Micro-Electromechanical Systems
MISO	Master In Slave Out
MOSI	Master Out Slave In
NC	Not Connected
PMOD™	Peripheral Module
PWM	Pulse Width Modulation
RXD	Receive Data
SCI	Serial Communications Interface
SCL	Serial Clock Line
SDA	Serial Data Line
SMD	Surface Mount Device
SPI	Serial Peripheral Interface
SRAM	Static Random Access Memory
SWD	Serial Wire Debug
TXD	Transmit Data
UART	Universal Asynchronous Receiver-Transmitter
USB	Universal Serial Bus

1. Kit Overview

The CK-RA6M5, Cloud Kit for RA6M5 MCU Group, enables users to experience the cloud connectivity options available from Renesas and Renesas Partners. A broad array of sensors on the CK-RA6M5 provide multiple options for observing user interaction with the Cloud Kit. By selecting from a choice of add-on devices, multiple cloud connectivity options are available.

MCU Features

- R7FA6M5BH3CFC MCU (referred to as RA MCU)
- 200 MHz, Arm® Cortex®-M33 core
- 2 MB Code Flash, 8 kB data flash, 512 kB SRAM
- 176 pins, LQFP package
- MCU current measurement points for precision current consumption measurement
- Multiple clock sources - RA MCU oscillator and sub-clock oscillator crystals, providing precision 24.000 MHz and 32,768 Hz reference clock. Additional low-precision clocks are available internal to the RA MCU

Ecosystem Access and Connectivity

- USB Full Speed Host and Device (micro AB connector)
- USB High Speed Device (micro AB connector)
- Three 5 V input sources
  - USB (Debug, Full Speed)
  - External power supply (using traditional pin jumpers)
- Debug modes
  - Debug on-board (SWD)
  - Debug in (ETM, SWD, and JTAG)
- User LEDs and buttons
  - Four User LEDs (red, blue, green, RGB)
  - Power LED (white) indicating availability of regulated power
  - Debug LED (yellow) indicating the debug connection
  - One User button
  - One Reset button
- Two of the most popular ecosystems expansions
  - 2 Digilent Pmod™ (Type 2A and Type 6A) connectors
  - Arduino™ (Uno R3) connector
- MCU boot configuration jumper
- Ethernet (RJ45 RMII interface)

Sensors

- Renesas HS3001 Humidity and Temperature sensor
- Renesas ZMOD4410 Indoor Air Quality Index sensor
- Renesas ZMOD4510 Outdoor Air Quality Index sensor
- Renesas OB1203 Biometric sensor
- TDK ICP-10101 Barometric Pressure sensor
- TDK ICM-20948 IMU (Gyroscope, Magnetometer, Accelerometer)
- Knowles SPH0645LM4H-B MEMS Microphones in stereo configuration

Arduino Uno Connectors (Analog and Power)

Sensors

Arduino Uno Connector (Digital)

Pmod 1 Power Test Point

Pmod 1 Connector

Reset Switch

User Switch

User LEDs

USB High Speed

RA MCU

USB Full Speed

Biometric Sensor

+3.3V Test Point

Pmod 2 Connector

Pmod 2 Power Test Point

Debug (JTAG/SWD) Connector

Debug LED and USB

MEMS Microphones

Ethernet
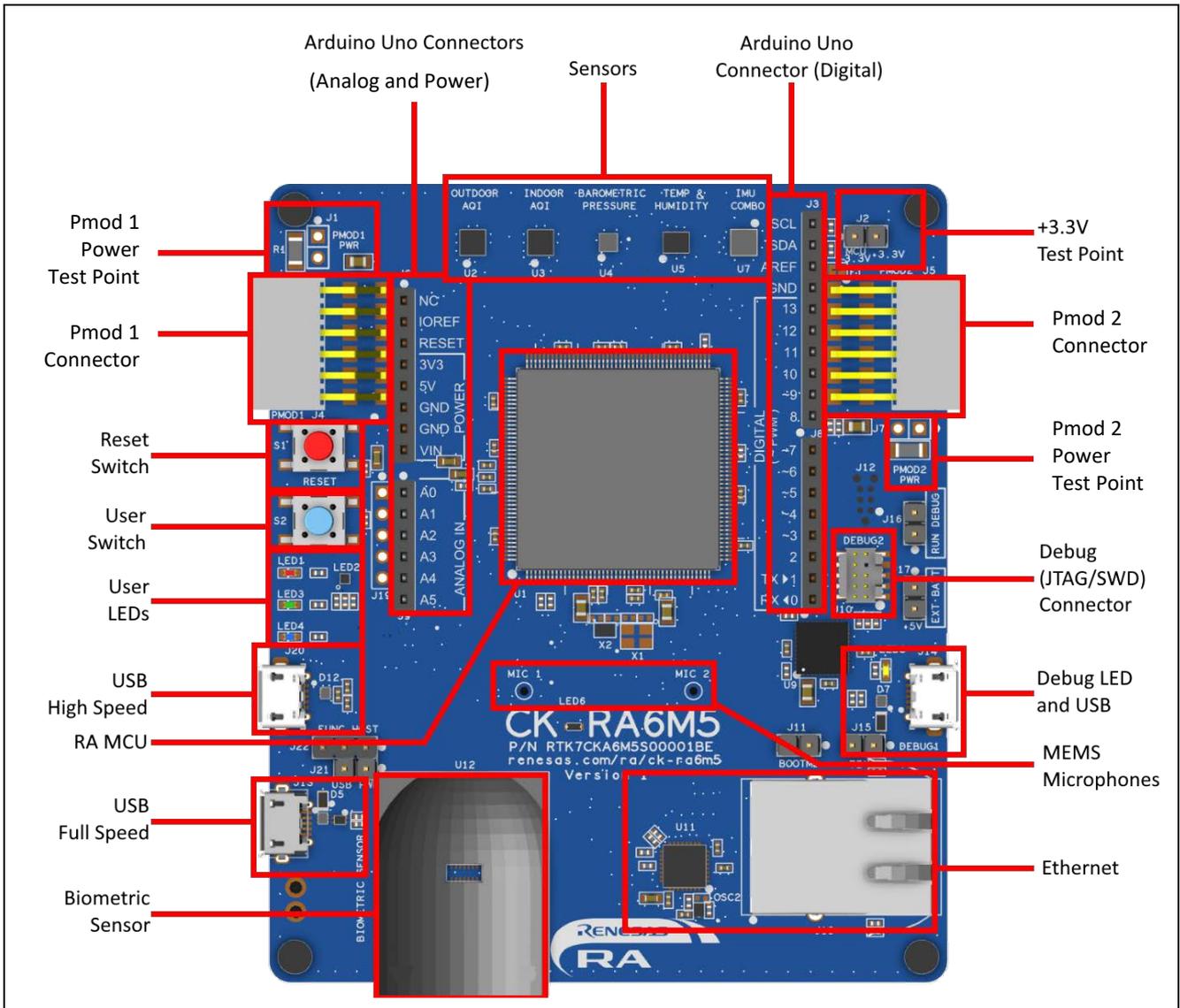
Figure 1. CK-RA6M5 Board Top Side
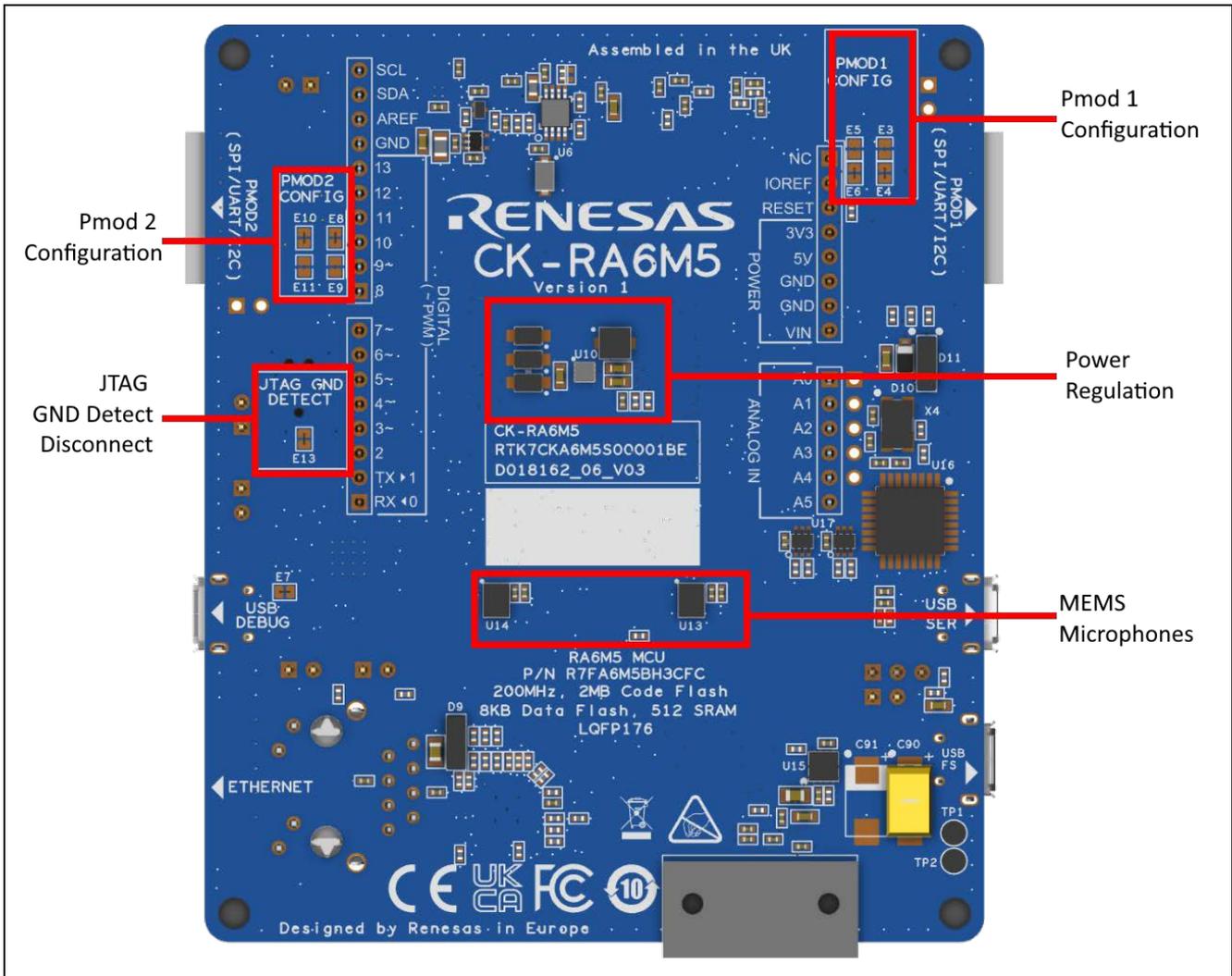
Figure 2.   CK-RA6M5 Board Bottom Side

1.1   Assumptions and Advisory Notes

1.   It is assumed that the user has a basic understanding of microcontrollers and embedded systems hardware.
2.   It is recommended that the user refers to the *CK-RA6M5 Quick Start Guide* to get acquainted with the kit and the Quick Start example project that the CK-RA6M5 board comes pre-programmed with.
3.   Flexible Software Package (FSP) and an Integrated Development Environment (IDE) such as e² studio are required to develop embedded applications on the CK-RA6M5 kit.
4.   Instructions to download and install software, import example projects, build them and program the CK-RA6M5 board are provided in the quick start guide.
5.   The MCU fitted to the CK 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.   CK-RA6M5 v1 board
2.   RYZ014A PMOD (RA CAT-M1 Cloud Kit)
3.   Micro USB to A cable
4.   Micro USB A/B to A adapter cable
5.   Sim Card (RA CAT-M1 Cloud Kit)
6.   Antenna (RA CAT-M1 Cloud Kit)
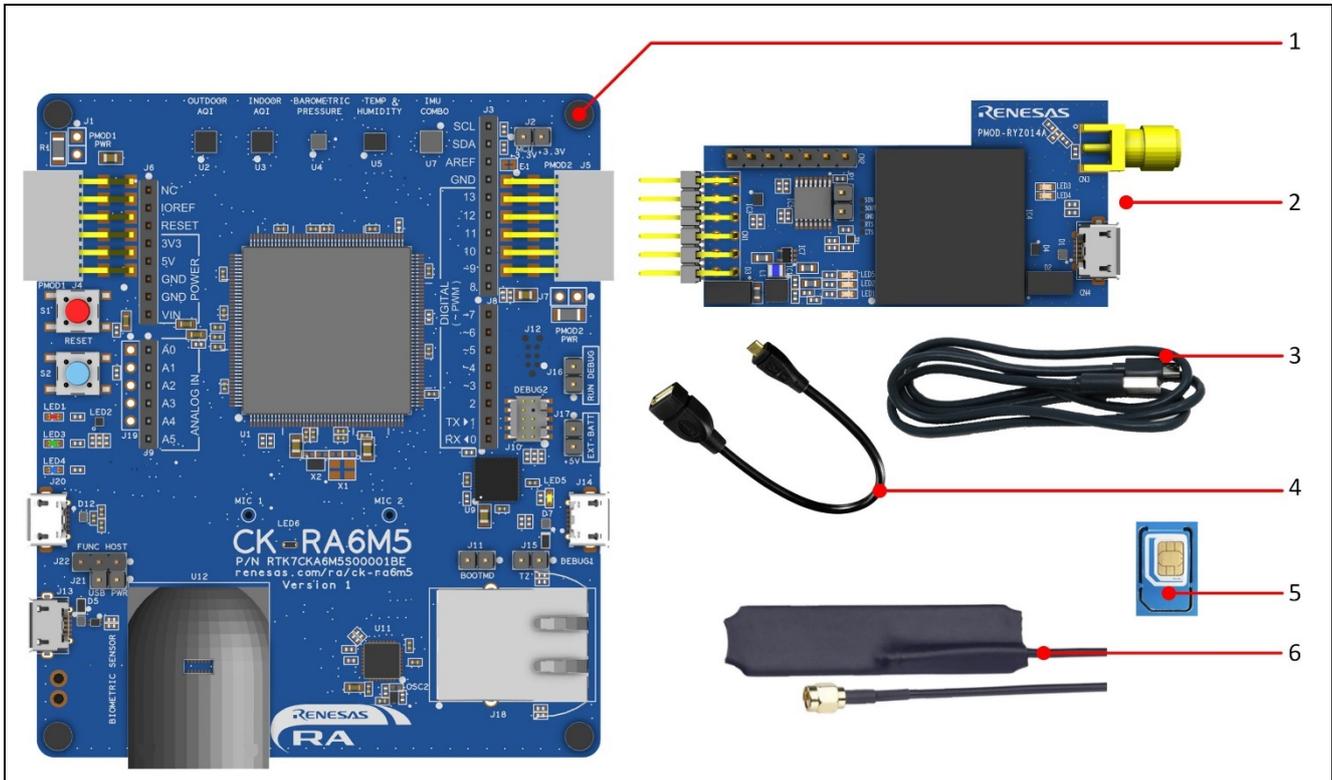
Figure 3.   CK-RA6M5 Kit Contents

3.   Ordering Information

• CK-RA6M5 v1 kit orderable part number: RTK7CKA6M5S0400**1**BE

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

• CK-RA6M5 board dimensions: 80 mm (width) x 95 mm (length)

4.   Hardware Architecture and Default Configuration

4.1   Kit Architecture

The CK-RA6M5 board is designed to demonstrate many options available to connect the RA6M5 MCU to various cloud services. The board includes the RA6M5 MCU, multiple environmental sensors and connectivity options such as USB, Ethernet, and Pmod connections for use with add-on wireless connectivity devices, as well as support for Arduino Uno R3 shields. The board also includes an on-board debugger and all required hardware needed to power, program, and debug software running on the MCU. There are LED indicators and a push-button available for user interaction with the board. To allow portability the board includes a 2-pin header for a battery connection which can run with 3 x AA batteries.

Most of the on-board sensors are connected to the MCU using I^{2}C. The on-board microphones use the SSIE peripheral on the RA6M5 MCU.

Board Functionality	Area Features	Function present on all similar kits	Functionality is:
MCU Native Access	RA MCU, power / current measurement	Yes	MCU dependent
System Control and Ecosystem Access	Power, Debug MCU, User LED and buttons, reset, ecosystem connectors, USB Full Speed, Boot configuration, Ethernet	Yes	Same or similar across similar kits

4.2   System Block Diagram
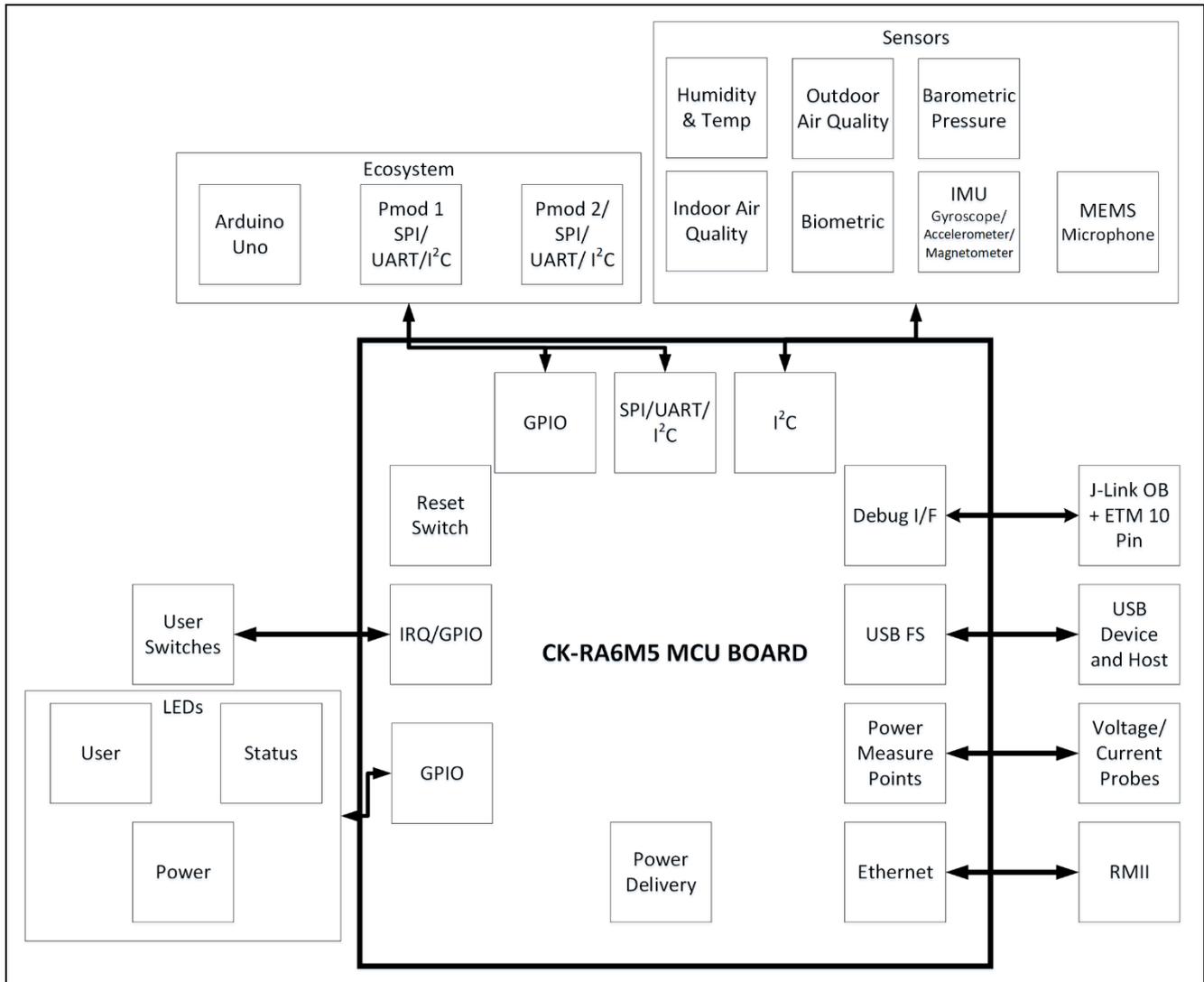
Figure 4.   CK-RA6M5 Board Block Diagram

4.3   Jumper Settings

Two types of jumpers are provided on the CK-RA6M5 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. The silk screen overlay printing around a trace-cut jumper is a solid box. 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. The silkscreen overlay printed around a solder-bridge jumper has gaps in the surround. Three methods can be used for joining:

- 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, size 0805, 0603, or 0402, may be placed across the two pads and soldered in place. A zero-ohm 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.)
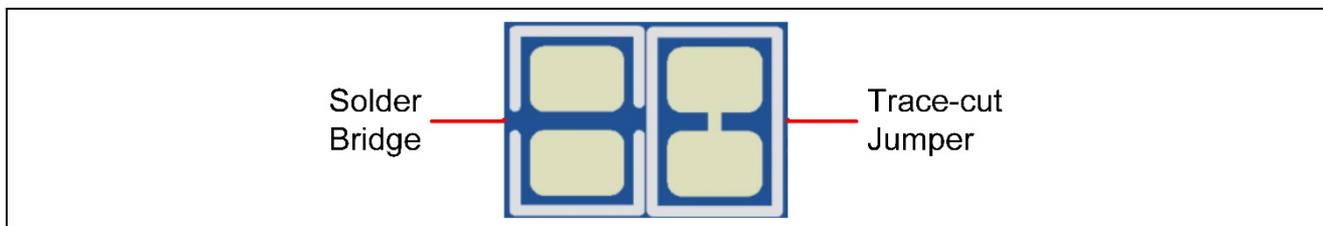
Figure 5.   Copper Jumpers

4.3.2   Traditional Pin Header Jumpers

These jumpers are traditional small pitch jumpers that require an external shunt to open/close them. The traditional pin jumpers on the CK-RA6M5 board are 2.54 mm pitch headers and require compatible 2.54 mm shunt jumpers.

4.3.3   Default Jumper Configuration

The following table describes the default settings for each jumper on the CK-RA6M5 board. This includes copper jumpers (Ex designation) and traditional pin jumpers (Jx designation).

The Circuit Group for each jumper is the designation 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 kit.

Table 2.   Default Jumper Settings

Location	Circuit Group	Default Open/Closed	Function
J1	Pmod 1	Open	Current Measurement point for Pmod 1
J2	MCU Power	Closed	Current Measurement point for MCU
J7	Pmod 2	Open	Current Measurement point for Pmod 2
J11	MCU Boot Mode	Open	Configures the MCU for normal boot mode
J15	JLOB	Open	Enable TrustZone support
J16	JLOB	Open	Enable use of external JTAG emulator
J17	HMI Power	Open	Connect external power source
J21	USBFS	Closed	Enable USB bus-powered operation
J22	USBFS	Link 2-3	USB Device Mode
E1	AREF	Closed	Links AREF to +3.3V
E3	Pmod 1	Open	Connects P512 (SCL1) to Pmod 1
E4	Pmod 1	Closed	Connects P202 (MISOA/RXD9) to Pmod 1
E5	Pmod 1	Open	Connects P511 (SDA1) to Pmod 1
E6	Pmod 1	Closed	Connects P204 (RSPCKA/SCK9) to Pmod 1
E7	Power	Closed	Connects JLOB to +3.3 V
E8	Pmod 2	Closed	Connects P412 (RSPCKB/SCK0) to Pmod 2
E9	Pmod 2	Open	Connects P613 (SDA7) to Pmod 2
E10	Pmod 2	Closed	Connects P410 (MISOB/RXD0) to Pmod 2
E11	Pmod 2	Open	Connects P614 (SCL7) to Pmod 2
E13	JTAG	Closed	Connects JTAG GND detect pin on J10 to GND

5. System Control and Ecosystem Access

The CK-RA6M5 provides a power supply regulator, an on-board debugger, simple I/O (switches and LEDs), and popular I/O ecosystem connectors. These are all described in detail below.

5.1   Power

The CK-RA6M5 kit is designed for +5 V operation. An on-board switching voltage regulator (ISL8002IRZ) is used to convert the 5 V supply to a 3.3 V supply. Also available is a low dropout regulator (ISL9008AIECZ-T) to convert the 3.3 V supply to a 1.8 V supply. The 3.3 V supply is used to power the RA MCU and other peripheral features as well as some of the sensors. The 1.8 V supply is used to power some of the motion and pressure sensors.

5.1.1   Power Supply Options

This section describes the different ways in which CK-RA6M5 kit can be powered.
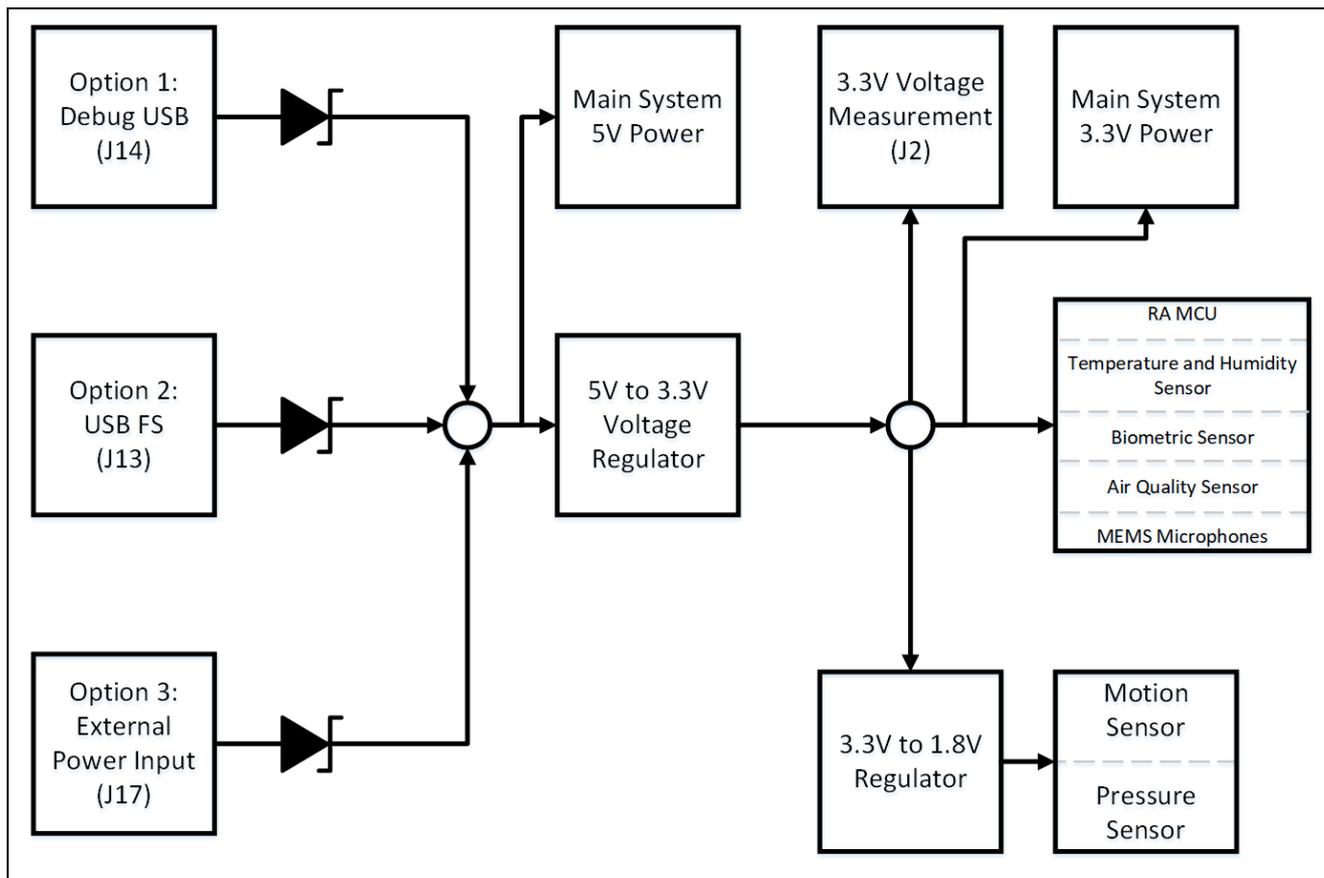
Figure 6.   Power Supply Options

5.1.1.1   Option 1: Debug USB

5 V may be supplied from an external USB host to the USB Debug connector (J14) labelled DEBUG1 on the board. Power from this source is connected to the Main System 5 V Power. Reverse current protection is provided between this connector and the Main System 5 V Power.

5.1.1.2   Option 2: USB Full Speed

5 V may be supplied from an external USB host to the USB Full Speed connector (J13) labelled USB FS on the board. Power from this source is connected to the Main System 5 V Power. Reverse current protection is provided between this connector and the Main System 5 V Power.

5.1.1.3   Option 3: External Power Input

5 V may be supplied from an external power supply or battery to 2 pin header J17. Polarity is J17-2 (5 V) and J17-1 (GND) Pin headers, Power from this source is connected to the Main System 5 V Power. Reverse current protection is provided between the 5 V test points and the Main System 5 V Power.

5.1.2   Power Supply Considerations

The on-board regulator which supplies +3.3 V has a built-in current limit of 2.0 A and the regulator which supplies +1.8 V has a built-in current limit of 150 mA. Make sure that the total current required by the RA MCU, any active on-board features, and any connected peripheral device does not exceed these limits.

Note: The total current available from a typical USB host is 500 mA maximum. Depending on the configuration of the kit, multiple power sources may be required.

5.1.3   Power-up Behavior

When powered, the white LED near the center of the board (the "dash" in the CK-RA6M5 name) will light up. For more details on initial power up behavior, see the *CK-RA6M5 Quick Start Guide*.

5.2   Debug and Trace

The CK-RA6M5 board supports the following two debug modes.

Table 3.   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	S124 (on-board)	RA6M5 (on-board)	SWD	Micro USB (J14)
Debug in	External debugging tools	RA6M5 (on-board)	SWD, ETM, JTAG	10-pin connector (J10)

Notes:
- See Table 5 for the Debug USB connector pin definition.
- See Table 8 for the 10-pin JTAG connector pin definition.

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

Table 4.   Jumper Connection Summary for Different Debug Modes

Debug Modes	J15	J16
Debug on-board	Closed	Open
Debug in	Closed	Closed

5.2.1   Debug On-Board

The on-board debug functionality is provided using Renesas S124 Debug MCU and SEGGER J-Link® firmware. Debug USB Micro-B connector (J14) connects the S124 Debug MCU to an external USB Full Speed Host, allowing re-programming and debugging of the target RA MCU firmware. This connection is the default debug mode for the CK-RA6M5 board.

The S124 Debug MCU connects to the target RA MCU using the SWD interface.

Table 5.   Debug USB Connector

Debug USB Connector		CK-RA6M5
Pin	Description	Signal/Bus
J14-1	+5VDC	+5V_USB_DBG
J14-2	Data-	USB_DM (U9-12)
J14-3	Data+	USB_DP (U9-13)
J14-4	USB ID, jack internal switch, cable inserted	NC
J14-5	Ground	GND

A yellow indicator, LED5, shows the visual status of the debug interface. When the CK-RA6M5 board is powered on, and LED5 is blinking, it indicates that the S124 Debug MCU is not connected to a programming host. When LED5 is on solid, it indicates that the S124 Debug MCU is connected to a programming interface. When LED5 is flickering it indicates that there is active communication between the debugger and the host PC.

To configure the CK-RA6M5 board to use the Debug On-Board mode, configure the jumpers using the following table.

Table 6.   Debug On-Board Jumper Configuration

Location	Default Open/Closed	Function
J15	Closed	Target RA MCU MD connected to debug
J16	Open	S124 Debug MCU in normal operation mode
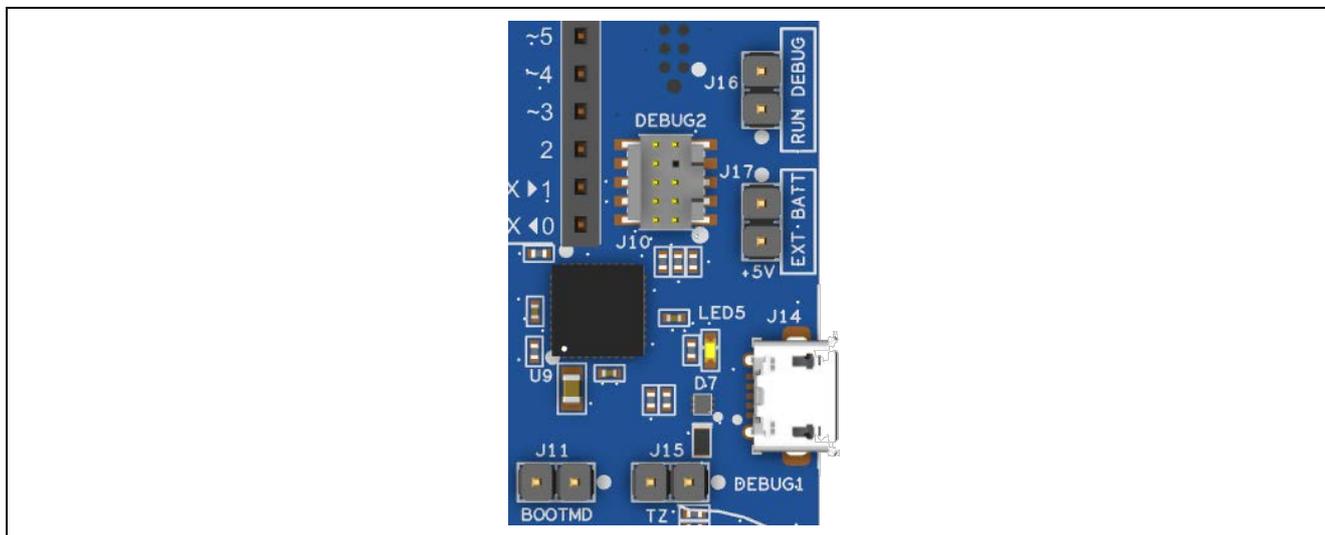
Figure 7.   CK-RA6M5 Debug Interface

5.2.2   Debug In

One 10-pin Cortex® Debug Connector at J10 supports JTAG and SWD. This connector may be used for external debug of the target RA MCU.

To configure the CK-RA6M5 board to use the Debug In mode, configure the jumpers using the following table.

Table 7.   Debug In Mode Jumper Configuration

Location	Default Open/Closed	Function
J15	Closed	Target RA MCU MD connected to debug
J16	Closed	S124 Debug MCU is held in RESET

Table 8.   JTAG/SWD Connector

JTAG Connector			CK-RA6M5
Pin	**JTAG Pin Name**	**SWD Pin Name**	**Signal/Bus**
J10-1	Vtref	Vtref	+3V3
J10-2	TMS	SWDIO	P108/SWDIO
J10-3	GND	GND	GND
J10-4	TCK	SWCLK	P300/SWCLK
J10-5	GND	GND	GND
J10-6	TDO	SWO	P109/TDO
J10-7	Key	Key	NC
J10-8	TDI	NC/EXTb	P110/TDI
J10-9	GNDDetect	GNDDetect	GND (cut E13 to open)
J10-10	nSRST	nSRST	RESET#

Note: The Cortex® Debug Connector is fully described in the Arm® CoreSight™ Architecture Specification.

5.3 Ecosystem

The Ecosystem connectors provide users the option to simultaneously connect several third-party add-on modules compatible with two popular ecosystems using the following connectors:

1. Two Digilent Pmod™ (SPI and UART) connectors
2. Arduino™ (Uno R3) connectors

5.3.1 Digilent Pmod™ Connectors

Two 12-pin connectors are provided to support Pmod modules where the RA 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).

The CK-RA6M5 board also provides jumpers so the 12-pin connector may alternatively be used for 2 independent 6-pin Pmod devices where the top row supports Pmod Type-2 (SPI) and Type-3 (UART) while the bottom row supports Pmod Type-6 (I^2C).

The default 12-pin Pmod interface supports +3.3 V devices. Please ensure that any Pmod device installed is compatible with a +3.3 V supply.

The 6-pin Pmod interface option for Type-6 (I^2C) may also support +5.0 V devices. Please ensure that only 6-pin modules are used when this option is selected.

5.3.1.1 Pmod 1 Connector

A 12-pin Pmod connector is provided at J4, Pmod 1.

Table 9. Pmod 1 Connector

Pmod 1 Connector Default			CK-RA6M5	Pmod 1 Configuration	
Pin	Description	Option Type 6A	Signal/Bus	Short	Open
J4-1	SSLA / CTS_RTS	NC	P205 (SSLA0/CTSRTS9)		
J4-2	MOSI / TXD	NC	P203 (MOSIA/TXD9)		
J4-3	MISO / RXD		P202 (MISOA/RXD9)	E4	E3
		SCL	P512 (SCL1)	E3	E4
J4-4	SCK/RTS		P204 (RSPCKA/SCK9)	E6	E5
		SDA	P511 (SDA1)	E5	E6
J4-5	GND		GND		
J4-6	VCC		+3.3 V	E1	E2
J4-7	GPIO / INT (slave to master)		P005 (IRQ10)		
J4-8	GPIO / RESET (master to slave)		P311		
J4-9	GPIO / CS1		P206 (SSLA1)		
J4-10	GPIO / CS2		P207 (SSLA2)		
J4-11	GND		GND		
J4-12	VCC		+3.3 V	E1	E2

Note: Exercise caution while modifying power source trace jumpers, E1 and E2. Permanent damage to the CK-RA6M5 board and/or connected modules may result.
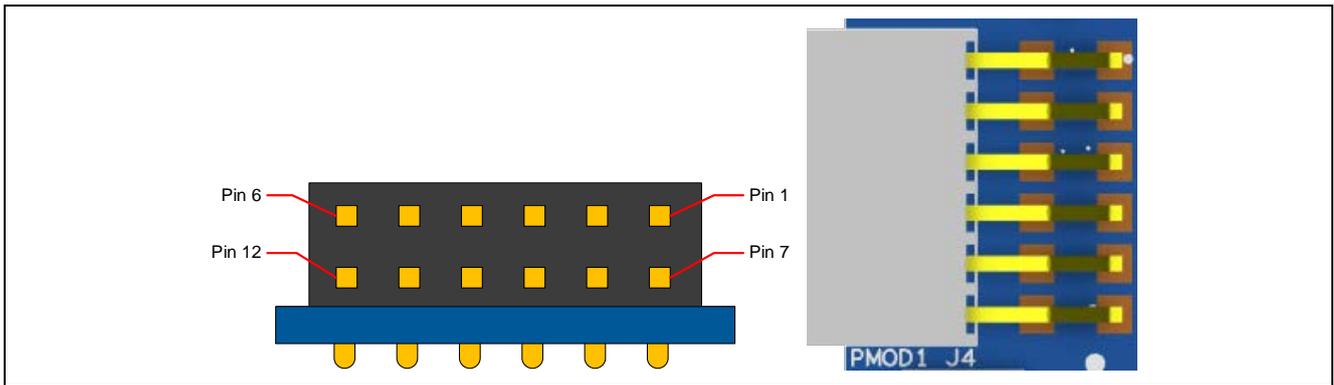
Figure 8.   Pmod 1 Connector

5.3.1.2   Pmod 2 Connector

A 12-pin Pmod connector is provided at J5, Pmod 2.

Table 10. Pmod 2 Connector

Pmod 2 Connector Default			CK-RA6M5	Pmod 2 Configuration	
Pin	Description	Option Type 6A	Signal/Bus	Short	Open
J5-1	SS / CTS	NC	P413 (SSLB0/CTS0)		
J5-2	MOSI / TXD	NC	P411 (MOSIB/TXD0)		
J5-3	MISO / RXD		P410 (MISOB/RXD0)	E10	E11
		SCL	P614 (SCL7)	E11	E10
J5-4	SCK/RTS		P412 (RSPCKB/SCK0)	E8	E9
		SDA	P613 (SDA7)	E9	E8
J5-5	GND		GND		
J5-6	VCC		+3.3 V	E14	E12
J5-7	GPIO / INT (slave to master)		P004 (IRQ9)		
J5-8	GPIO / RESET (master to slave)		P409		
J5-9	GPIO / CS1		P414 (SSLB1)		
J5-10	GPIO / CS3		P708 (SSLB3)		
J5-11	GND		GND		
J5-12	VCC		+3.3 V	E14	E12
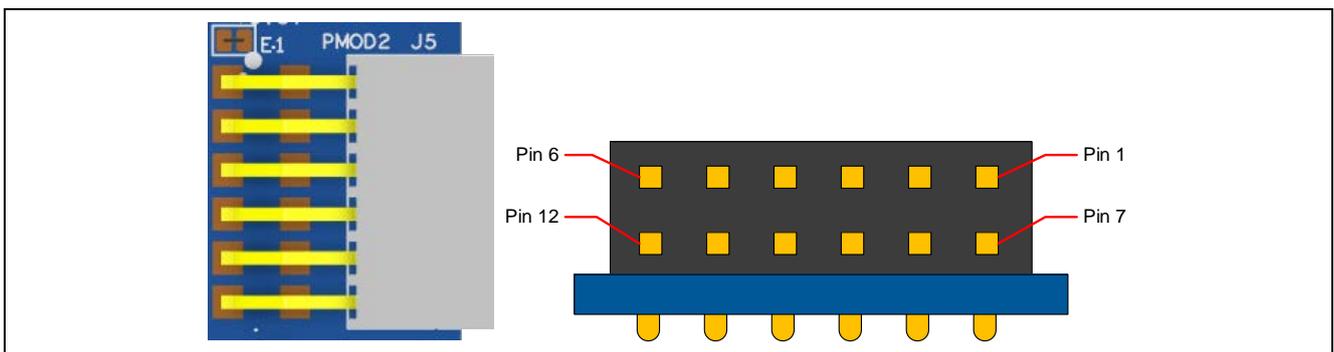
Figure 9.   Pmod 2 Connector

5.3.2 Arduino™ Connector

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

Table 11. Arduino Uno Connections

	Arduino Compatible Connector	CK-RA6M5
Pin	Description	Signal/Bus
J6-1	NC	NC
J6-2	IOREF	+3.3 V
J6-3	RESET	P303
J6-4	3.3 V	+3.3 V
J6-5	5 V	+5 V
J6-6	GND	GND
J6-7	GND	GND
J6-8	VIN	NC
J9-1	A0	P000 (AN000)
J9-2	A1	P001 (AN001)
J9-3	A2	P002 (AN002)
J9-4	A3	P003 (AN003)
J9-5	A4	P014 (AN012)
J9-6	A5	P015 (AN013)
J8-1	D0 / RXD	P706 (RXD3)
J8-2	D1 / TXD	P707 (TXD3)
J8-3	D2 / INT0	P006 (IRQ11)
J8-4	D3 / INT1 / PWM	P111 (IRQ4/GTIOC3A)
J8-5	D4 / PWM	P415 (IRQ8/GTIOC0A)
J8-6	D5 / PWM	P105 (GTIOC1A)
J8-7	D6 / PWM	P104 (GTIOC1B)
J8-8	D7 / PWM	P115 (GTIOC4A)
J3-1	D8 / CLKOUT	P611
J3-2	D9 / PWM	P608 (GTIOC4B)
J3-3	D10 / SPI_SS / PWM	P503 (SSL6)
J3-4	D11 / SPI_MOSI / PWM	P506 (MOSI6)
J3-5	D12 / SPI_MISO	P505 (MISO6)
J3-6	D13 / SPI_SCK	P504 (SCK6)
J3-7	GND	GND
J3-8	AREF	VREFH / VREFH0 (linked to +3.3 V)
J3-9	I2C_SDA	P511 (SDA1)
J3-10	I2C_SCL	P512 (SCL1)
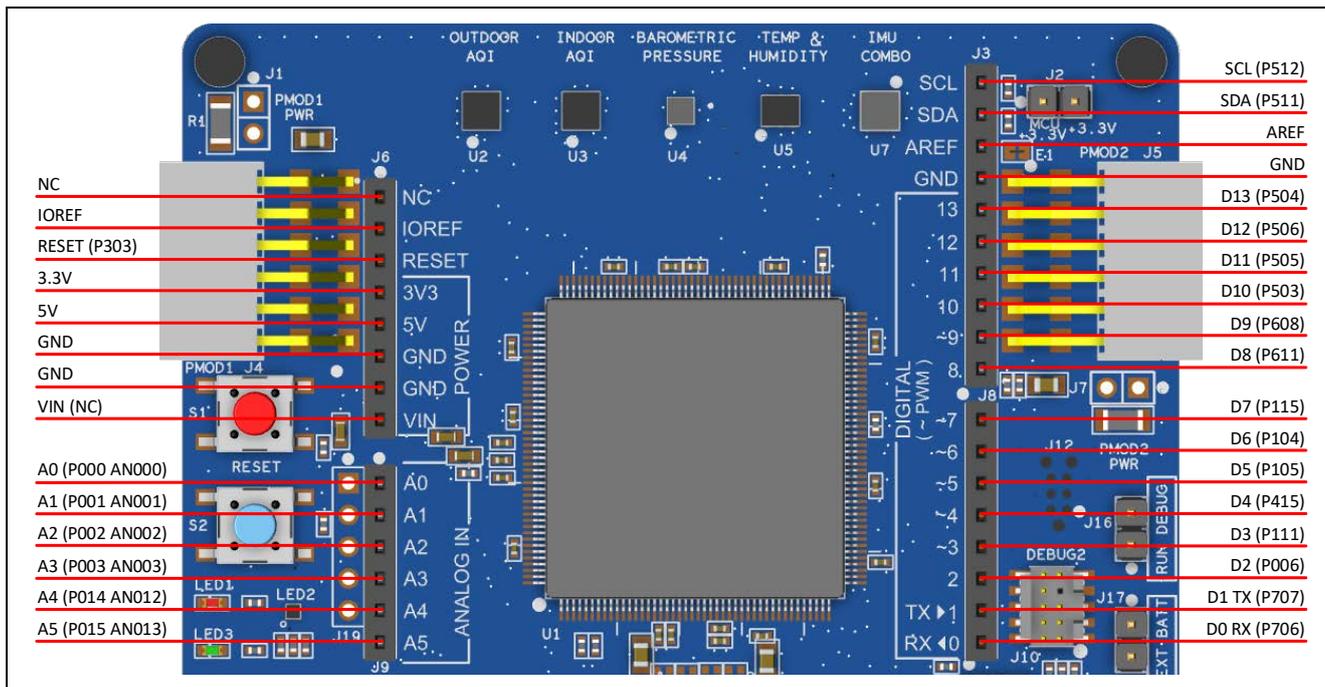
Figure 10.   Arduino Uno Connectors

5.4   Connectivity

5.4.1   USB Full Speed

The USB Micro-AB connection jack (J13) connects the RA MCU USB Full Speed interface to an external USB interface, allowing communications for testing and use of the RA MCU firmware.

Table 12. USB Full Speed Connector

USB Full Speed Connector		CK-RA6M5
Pin	Description	Signal/Bus
J13-1	+5 VDC	+5V_USBFS, P407/USBFS_VBUS
J13-2	Data-	USB_DM
J13-3	Data+	USB_DP
J13-4	USB ID, jack internal switch, cable inserted	NC
J13-5	Ground	GND
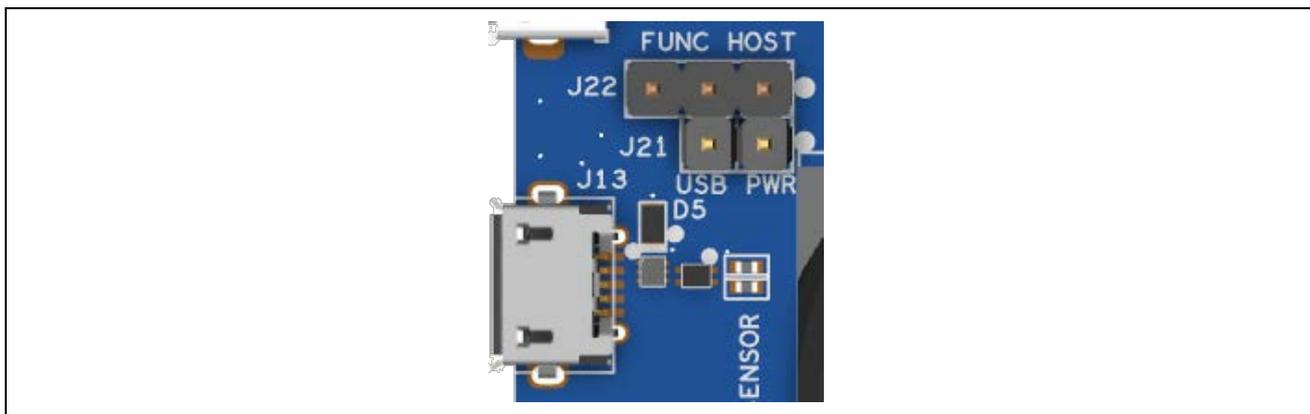
Figure 11.   USB Full Speed Connector

5.5 Miscellaneous

5.5.1 User and Power LEDs

6 LEDs are provided on the CK-RA6M5 board. In addition, the Ethernet connector has built-in link status and link speed LEDs.

Behavior of the LEDs on the CK-RA6M5 board is described in the following table.

Table 13. CK-RA6M5 Board LED Functions

Designator	Color	Function	MCU Control Port
LED1	Red	User LED	P610
LED2	RGB	User LED	R:P602, G:P603, B:P605
LED3	Green	User LED	P609
LED4	Blue	User LED	P601
LED5	Yellow	Debug LED	J-Link OB MCU
LED6	White	Power on indicator	+3.3 V
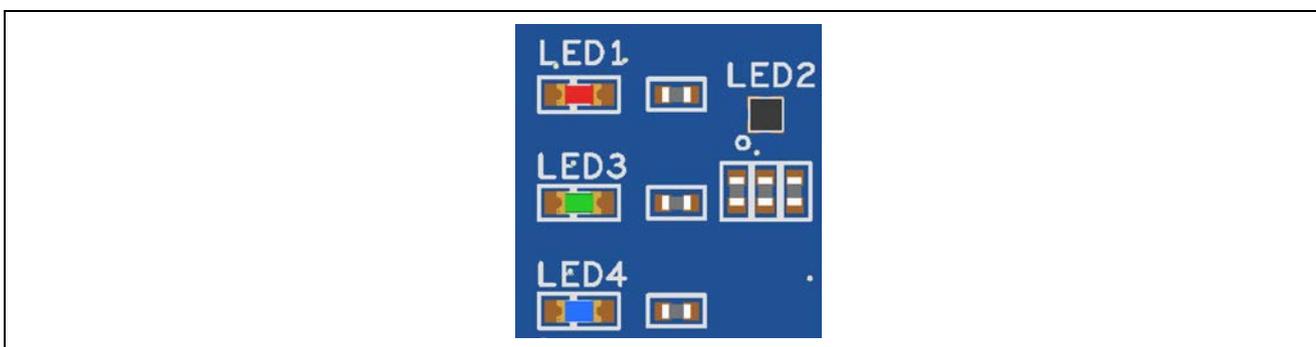
Figure 12.   User LEDs

Figure 13.   Power LED

5.5.2 User and Reset Switches

Two miniature, momentary, mechanical push-button type SMT switches are mounted on the CK-RA6M5 board.

Pressing the Reset switch (S1) generates a reset signal to restart the RA MCU.

Table 14. CK-RA6M5 Board Switches

| Designator	Function	MCU Control Port	Button Color
S1	MCU Reset Switch	RESET#	Red
S2	User Switch	P804 (IRQ01)	Blue
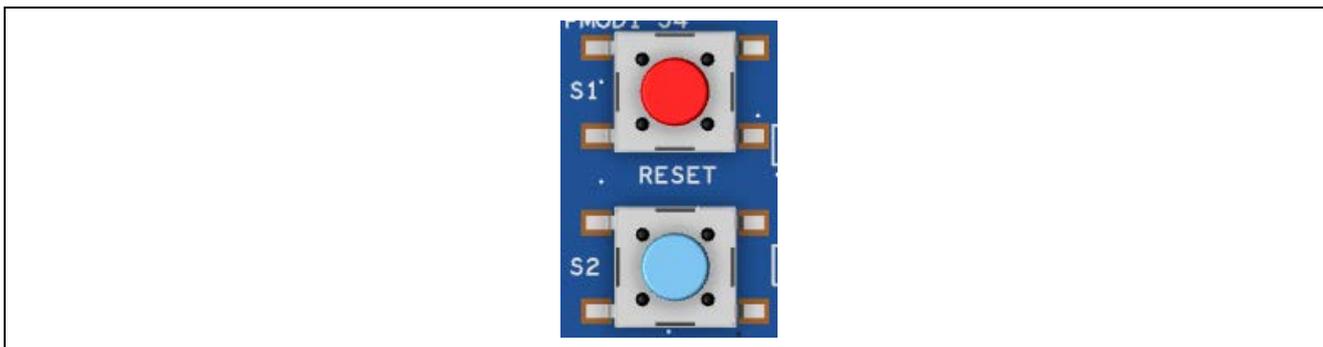
Figure 14.　Reset and User Switches

5.5.3　MCU Boot Mode

A two-pin header (J11) is provided to select the Boot mode (P201) of the RA MCU. For normal operation, or Single-Chip mode, leave J11 open. To enter SCI Boot mode or USB Boot mode, place a jumper on J11.
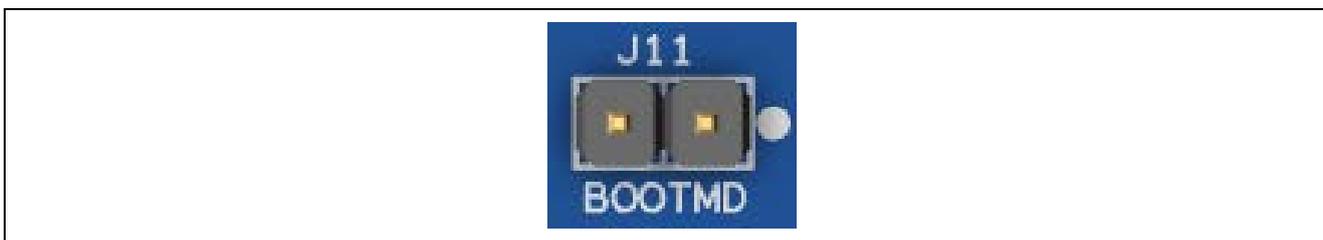
Figure 15.　Boot Mode

5.6　Ethernet

The Ethernet interface uses an RMII Ethernet Physical Layer Transceiver (PHY) (U11), connected to an RJ45 standard Ethernet connector (J18) with integrated magnetics and status indicators. The Ethernet clock is sourced from a precision 25 MHz clock crystal connected directly to the Ethernet PHY.

Table 15. Ethernet Port Assignments

Ethernet Signal Description	RA6M5 MCU Port
IRQ	P803 (IRQ02)
MDC	P214
MDIO	P211
TXD1	P406
TXD0	P700
TXD_EN	P405
RXD1	P703
RXD0	P702
CRS_DV	P705
RX_ER	P704
REF-50-CK	P701
RST#	P210

Table 16. Ethernet Components

Component	Manufacturer	Manufacturer Part Number
Ethernet PHY	Microchip	ICS1894-32
RJ45 Connector	Pulse	J0011D21BNL
25 MHz Oscillator	EuroQuartz	25.000 x22/30/30-40+85/12pF
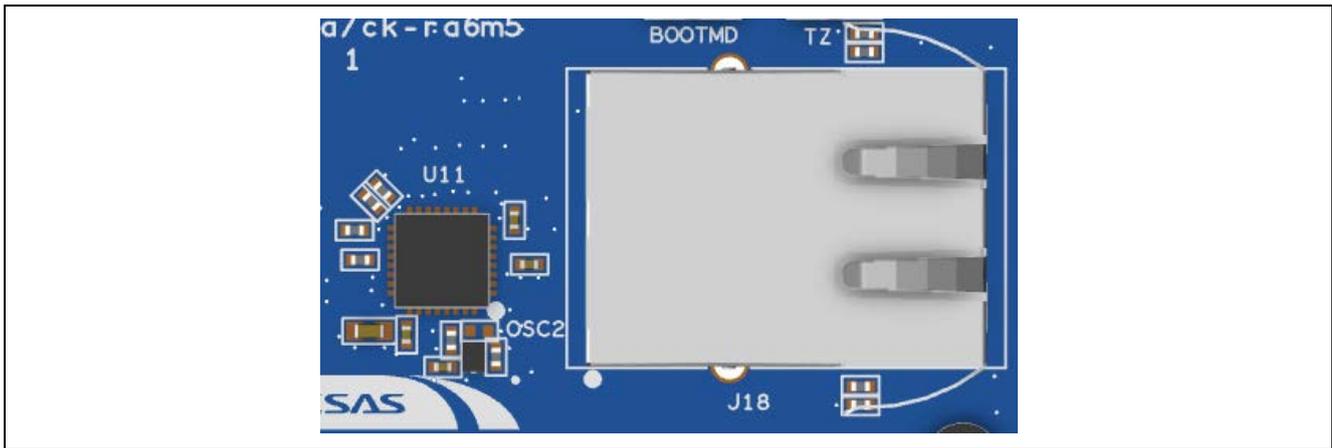
Figure 16.   Ethernet Connector

5.7   Onboard Sensors

The CK-RA6M5 is fitted with a number of onboard sensors, including a barometric pressure sensor, 9-axis MEMS motion tracking sensor, indoor air quality sensor, outdoor air quality sensor, biometric sensor, temperature and humidity sensor.
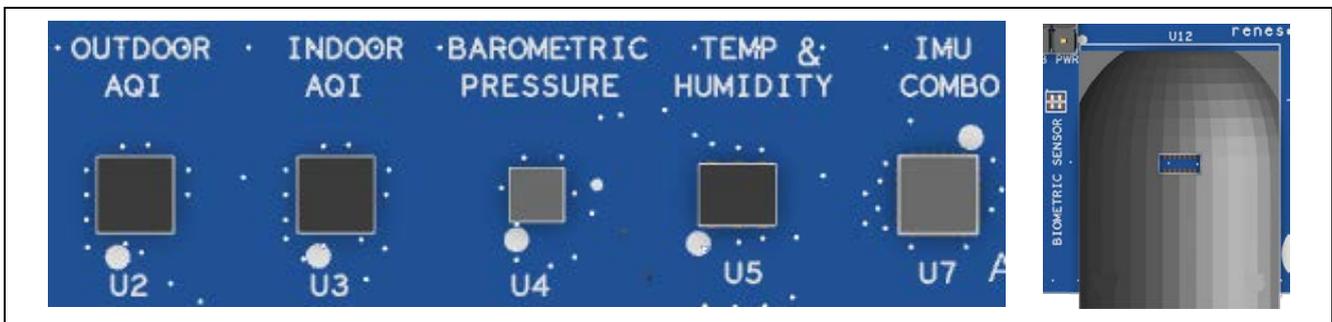
Figure 17.   On Board Sensors

5.7.1   HS3001 Temperature and Humidity Sensor

An integrated calibration and temperature compensation logic provides fully corrected Relative Humidity and Temperature values via a standard I²C output. The measured data is internally corrected and compensated for accurate operation over a wide range of temperature and humidity levels.

Table 17. HS3001 Port Assignment

Pin Number	HS3001 Signal Description	RA6M5 MCU Port
1	SCL	P400
2	SDA	P401
3	VC	Connect a 0.1 µF decoupling capacitor from VC to ground
4	VDD	3.3 V
5	NC	NC
6	VSS	GND

5.7.2   OB1203 Biometric Sensor

The OB1203 is a fully integrated optical sensing module for Pulse Oximetry (PPG - photoplethysmography), multi-channel Color Sensing (CS), Ambient Light Sensing (LS) and Proximity Sensing (PS). It can determine human heart rate, blood oxygen saturation (SpO2), respiration rate and heart rate variability (a measure of stress). The OB1203 integrates all light sources, drivers, and the sensor elements, in a single optically optimized package.

Table 18. OB1203 Port Assignment

Pin Number	OB1203 Signal Description	RA6M5 MCU Port
1	NC	NC
2	SCL	P400
3	SDA	P401
4	LGND	GND
5	LED1	TP1
6	LED2	TP2
7	LVDD	3.3 V
8	LVDD	3.3 V
9	LVDD	3.3 V
10	LVDD	3.3 V
11	VDD	3.3 V
12	AGND	GND
13	INT	P403 (IRQ14)
14	NC	NC

5.7.3   ZMOD4510 Outdoor Air Quality Sensor

The ZMOD4510 gas sensor platform detects air quality in a variety of indoor and outdoor applications. The signal conditioner controls the sensor temperature and measures the MOx resistance, which is a function of the gas concentration. The device is ideal for monitoring and reporting Outdoor Air Quality (OAQ).

Table 19. ZOMD4510 Port Assignment

Pin Number	ZMOD4510 Signal Description	RA6M5 MCU Port
1	SCL	P400
2	SDA	P401
3	INT	P404 (IRQ 15)
4	NC	NC
5	VDD	3.3 V
6	VSS	GND
7	VSS	GND
8	NC	NC
9	VSS	GND
10	VDDH	3.3 V
11	RES_N	P306
12	VDDIO	3.3 V

5.7.4   ZMOD4410 Indoor Air Quality Sensor

The ZMOD4410 Gas Sensor Module is designed for detecting total volatile organic compounds (TVOC) and monitoring indoor air quality (IAQ). The module's sense element consists of a heater element on a Si-based MEMS structure and a metal oxide (MOx) chemiresistor. The signal conditioner controls the sensor temperature and measures the MOx conductivity, which is a function of the gas concentration.

Table 20. ZMOD4410 Port Assignment

Pin Number	ZMOD4410 Signal Description	RA6M5 MCU Port
1	SCL	P400
2	SDA	P401
3	INT	P402 (IRQ4)
4	NC	NC
5	VDD	3.3 V
6	VSS	GND
7	VSS	GND
8	NC	NC
9	VSS	GND
10	VDDH	3.3 V
11	RES_N	P307
12	VDDIO	3.3 V

5.7.5   ICM-20948 9-AXIS MEMS Motion Tracking Sensor

The ICM-20948 is a low power 9-axis motion tracking sensor with 3-axis gyroscope, 3-axis accelerometer, and 3-axis compass, as well as Digital Motion Processor; offloading computation from the RA6M5 MCU improving system performance.

Table 21. ICM-20948 Port Assignment

Pin number	ICM-20948 Signal Description	RA6M5 MCU Port
1	NC	NC
2	NC	NC
3	NC	NC
4	NC	NC
5	NC	NC
6	NC	NC
7	AUX_CL	NC
8	VDDIO	GND via 100nF Capacitor
9	ADO/SD0	Pulldown to GND
10	REGOUT	GND via 100nF Capacitor
11	FSYNC	GND
12	INT1	P008 (IRQ12)
13	VDD	1.8 V
14	NC	NC
15	NC	NC
16	NC	NC
17	NC	NC
18	GND	GND
19	RESV_0	NC
20	RESV_1	GND
21	AUX_DA	NC
22	CS#	1.8 V
23	SCL	P400
24	SDA	P401

5.7.6   ICP-10101 Barometric Pressure Sensor

The ICP-10101 is based on MEMS capacitive technology which provides ultra-low noise at the lowest power, providing a high level of relative accuracy, sensor throughput, and temperature stability. The pressure sensor can measure pressure differences with an accuracy of ±1 Pa, enabling altitude measurement differentials as small as 8.5 cm.

Table 22. ICP-10101 Port Assignment

Pin Number	ICP-10101 Signal Description	RA6M5 MCU Port
1	RESV	NC
2	SCL	P400
3	RESV	NC
4	SDA	P401
5	RESV	NC
6	RESV	NC
7	RESV	NC
8	GND	GND
9	GND	GND
10	VDD	1.8 V

5.7.7   SPH0645 MEMS Microphones

The SPH0645LM4H-B is a miniature, low power, bottom port microphone with an I²S digital output. The solution consists of a high-performance acoustic sensor, a serial Analog to Digital convertor, and an interface to condition the signal into an industry standard 24-bit I²S format.

Table 23. SPH0645 Port Assignment

Pin Number	SPH0645 Signal Description	RA6M5 MCU Port
1	WS	P113 (SSIE0_WS)
2	SELECT	3.3 V
3	GND	GND
4	BCLK	P112 (SSIE0_SCK)
5	VDD	3.3 V
6	DATA-OUT	P114 (SSIE0_RXD)

6.   MCU Native Access Area

6.1   MCU and Pmod Current Measurement

Included in the Native Pin Access area are current measurement resistors and test points to measure the MCU USB controller current and the MCU core power current.

The CK-RA6M5 board has pin header test points for current measurement of the main 3.3 V MCU power and for Pmod power. To measure Pmod current remove 0 Ohm resistor and install pin header. Alternatively use a resistor of known value and measure the voltage drop across the resistor and use Ohm's Law to calculate the current. This process is not necessary for MCU power, because there is no resistor to be removed. J2 can be used to measure the MCU power, J1 can be used to measure Pmod 1 power, and J7 can be used to measure Pmod 2 power.
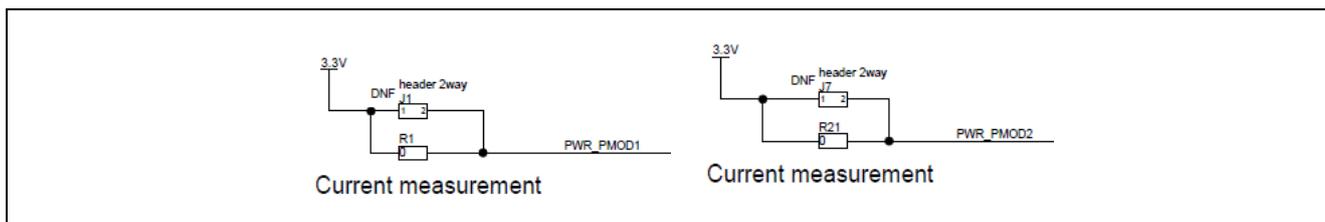

**Figure 18.   RA Pmod Current Measurement Circuit**
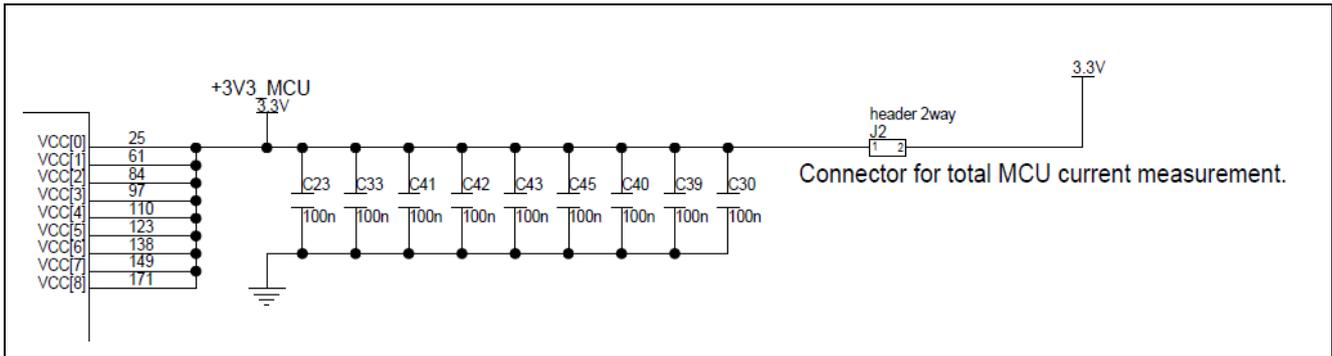
**Figure 19. RA +3.3 V Current Measurement Circuit**
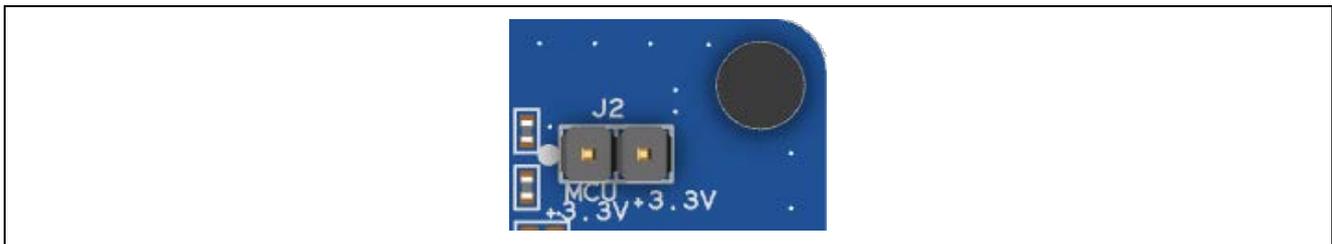
Figure 20. RA MCU Current Measurement

7. Recommended Parts

The below table lists recommended part numbers for optional components that can be fitted as required.

Table 24. Part Numbers

Designator(s)	Description	Manufacturer	Part Number
C18, C19	0402 Capacitor	YAGEO	CC0402JRNPO9BN150
C20, C21	0402 Capacitor	YAGEO	CC0402JRNPO9BN270
J1, J7	1 Row 2 Way header	Wuerth Elektronik	613 002 111 21
X1	24MHz Crystal	Diodes Inc.	FL2400022

8. Certifications

The CK-RA6M5 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 requried 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 requried 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 CK-RA6M5 v1 kit is available in the "CK-RA6M5v1 Design Package" available on renesas.com/ra/ck-ra6m5.

- Design package file name: ck-ra6M5-v1-designpackage.zip
- Design package contents

Table 25. CK-RA6M5 Board Design Package Contents

File Type	Content	File/Folder Name
File (PDF)	Schematics	ck-ra6m5-v1-schematics
File (PDF)	Mechanical Drawing	ck-ra6m5-v1-mechdwg
File (PDF)	3D Drawing	ck-ra6m5-v1-3d
File (PDF)	BOM	ck-ra6m5-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 RA family of microcontrollers, download tools and documentation, and get support.

CK-RA6M5 Resources	renesas.com/ra/ck-ra6m5
RA Kit Information	renesas.com/ra/kits
RA Product Information	renesas.com/ra
RA Product Support Forum	renesas.com/ra/forum
RA Videos	renesas.com/ra/videos
RA Kit Feedback and Feature Request	renesas.com/ra/kitfeedback
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 RA family of microcontrollers. The Renesas RA 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/ra/kitfeedback.

Revision History

Rev.	Date	Description	
		Page	**Summary**
1.00		—	Initial release
1.10	Jan.20.22	—	Updated figure 4, figure 6, and corrected various typos
2.00	Jan.20.22	—	Updated for WS2 release
3.00	May.03.22	—	Updated for MP release
3.10	Jan.16.23	20	Corrected ethernet phy part number

CK-RA6M5 v1 with RYZ014A Pmod
– User's Manual