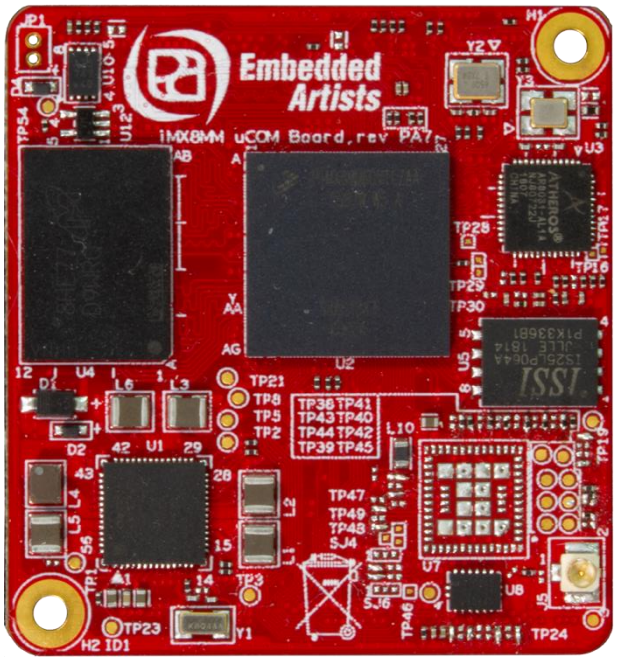
Document status: Preliminary



# iMX8M Mini uCOM Board Datasheet

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# Table of Contents

# 1 Document Revision History

| *Revision* | *Date* | *Description* |
|---|---|---|
| PA1 | 2019-10-15 | First version. |
| PA2 | 2020-04-17 | Updated description of boot switches. |
| PA3 | 2020-07-30 | Added section 0 |
| PA4 | 2020-11-04 | Updated documentation to reflect that it is 1ZM Wi-Fi/BT module that can be mounted |
| PA5 | 2023-03-26 | Added information about iMX8M Mini uCOM Developer's Kit V2 and V3. |
| PA6 | 2023-04-17 | Corrected pin naming of JB, pin 1-15. |
| PA7 | 2023-04-21 | Updated information about boot control. |
| PA8 | 2023-06-07 | Added information about board handling. |
| PA9 | 2024-01-19 | Added information about JB, pin 16. |

# 2 Introduction

This document is a datasheet that specifies and describes the *iMX8M Mini uCOM Board* mainly from a hardware point of view. Some basic software related issues are also addressed, like booting and functional verification, but there is separate software development documentation that should also be consulted.

## 2.1 Hardware

The *iMX8M Mini uCOM Board* is a Computer-on-Module (COM) based on NXP's ARM quad-core Cortex-A53 / M4 i.MX 8M Mini System-on-Chip (SoC) application processor. The board provides a quick and easy solution for implementing a high-performance ARM Cortex-A53 / M4 based design. The Cortex-A53 cores run at up to 1.8 GHz (1.6 GHz for industrial version) and the Cortex-M4 core at up to 400 MHz.

The heterogeneous core architecture enables the system to run an OS like Linux on the Cortex-A53 cores and a Real-Time OS (RTOS) on the Cortex-M4. This architecture is ideal for real time applications where Linux cannot be used for all time critical tasks. The Cortex-M4 can handle (real time) critical tasks and can also be used to lower power consumption.

The *iMX8M Mini uCOM Board* delivers high computational and graphical performance at low power consumption. The on-board PMIC, supporting DVFS (Dynamic Voltage and Frequency Scaling), together with a LPDDR4 memory sub-system reduce the power consumption.

The SoC is part of the scalable i.MX8M Mini product family. There is a range of i.MX RT/6/7/8/9 (u)COM Boards from Embedded Artists with single, dual and quad Cortex-A cores, with or without a heterogeneous Cortex-M core. Groups of boards (uCOM and COM) share the same basic pinning for maximum flexibility and performance scalability.

The *iMX8M Mini uCOM Board* has an ultra-small form factor and shields the user from a lot of complexity of designing a high performance system. It is a robust and proven design that allows the user to focus the product development, shorten time to market and minimize the development risk.

The *iMX8M Mini uCOM Board* targets a wide range of applications, such as:

- Portable systems
- HMI/GUI solutions
- Portable medical and health care
- Connected vending machines
- Point-of-Sale (POS) applications
- Access control panels
- Audio
- IP phones
- Smart appliances
- Wearables
- Home energy management systems
- Industrial automation
- HVAC Building and Control Systems
- Smart Grid and Smart Metering
- Smart Toll Systems
- Data acquisition
- Communication gateway solutions
- Connected real-time systems
- ...and much more

The picture below illustrates the block diagram of the *iMX8M Mini uCOM Board*.

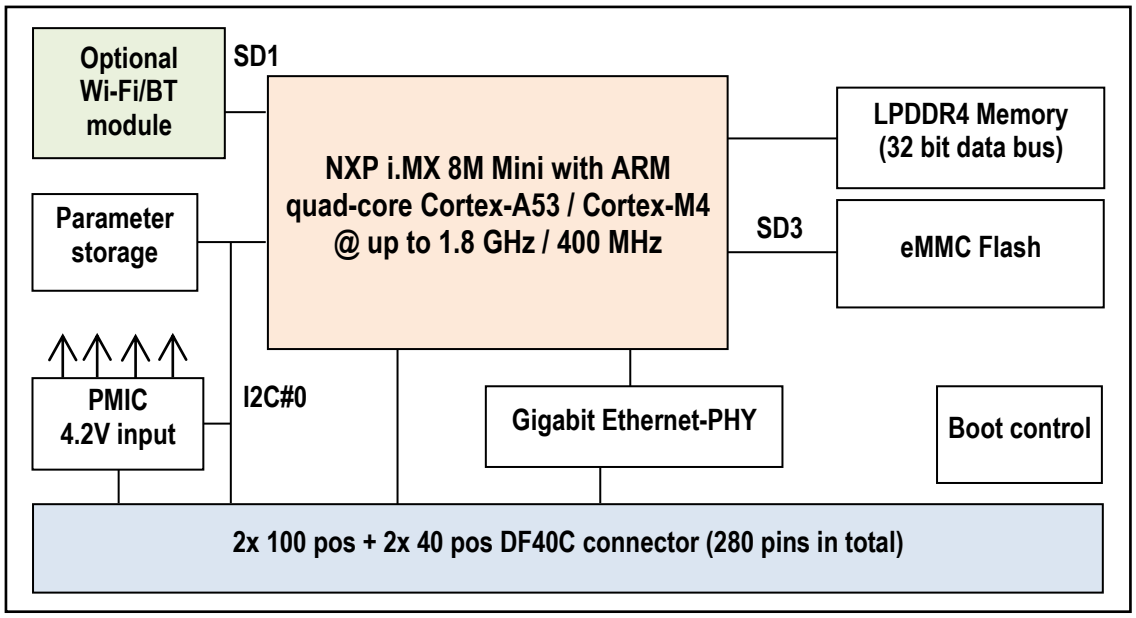


Figure 1 – iMX8M Mini uCOM Board Block Diagram

The *iMX8M Mini uCOM Board* pin assignment focus on direct connection to (carrier board) interface connectors and minimize trace and layer crossing. This is important for high speed, serial interfaces with impedance controlled differential pairs. As a result, carrier boards can be designed with few routing layers. In many cases, a four layer pcb is enough to implement advanced and compact carrier boards. The pin assignment is common for the *iMX RT/7/8/9 uCOM Boards* from Embedded Artists and the general, so called, EAuCOM specification is found in separate document.

## 2.2 Software

The *iMX8M Mini uCOM Board* has Board Support Packages (BSPs) for Linux and and SDK for the Cortex-M4 side. Precompiled images are available. Embedded Artists work with partners that can provide support for other operating systems (OS). For more information contact Embedded Artists support.

This document has a hardware focus and does not cover software development. See other documents related to the *iMX8M Mini uCOM Board* for more information about software development.

## 2.3 Features and Functionality

The i.MX 8M Mini is a powerful SoC. The full specification can be found in NXP's *i.MX 8M Mini Datasheet* and *i.MX 8M Mini Reference Manual*. The table below lists the main features and functions of the *iMX8M Mini uCOM board* - which represents Embedded Artists integration of the i.MX 8M Mini SoC. Due to pin configuration some functions and interfaces of the i.MX 8M Mini may not be available at the same time. See i.MX 8M Mini SoC datasheet and reference manual for details. Also see pin multiplexing Excel sheet for details.

| Group | Feature | | iMX8M Mini uCOM Board |
|---|---|---|---|
| CPUs | NXP SoC | commercial temp. range<br>industrial temp. range | MIMX8MM6DVTLZA (0 - 70° C)<br>MIMX8MM6CVTKZA (-40 - 85° C) |
| | CPU Cores | | 4x Cortex-A53<br>1x Cortex-M4F with MPU/FPU |
| | L1 Instruction cache | | 32 KByte on each Cortex-A53 |

| | | |
|---|---|---|
| | | 16 KByte on Cortex-M4 |
| | L1 Data cache | 32 KByte on each Cortex-A53<br>16 KByte on Cortex-M4 |
| | L2 Cache on Cortex-A53 cores | 512 KByte |
| | On-chip SRAM (TCM for Cortex-M4) | 256 KByte |
| | NEON SIMD media accelerator on Cortex-A53 | ✓ |
| | Maximum CPU frequency | 1.8/1.6 GHz on Cortex-A53 cores<br>400 MHz on Cortex-M4 |
| Security Functions | ARM TrustZone | ✓ |
| | Advanced High Assurance Boot | ✓ |
| | Cryptographic Acceleration and Assurance Module | ✓ |
| | Secure Non-Volatile Storage | ✓ |
| | System JTAG controller | ✓ |
| | Resource Domain Controller (RDC) | ✓ |
| Memory | LPDDR4 RAM Size | 1 GByte, default. Other on request. |
| | LPDDR4 RAM Speed | 3000 MT/s |
| | LPDDR4 RAM Memory Width | 32 bit |
| | eMMC NAND Flash (8 bit) | 8 GByte, default. Other on request. |
| Graphical Processing | Multimedia Graphics Processing Unit (GPU) | GCNanoUltra/GC320, OpenGL ES2.0/1.1, OpenVG1.1 |
| | Video Decode Acceleration | 1080p60 H.265, H.264, VP8, VP9 |
| | Video Encode Acceleration | 1080p60 H.264, VP8 |
| Graphical Output | MIPI-DSI, 4 lanes | ✓ up to 1080p60 resolution |
| Graphical Input | MIPI-CSI, 4 lanes | ✓ |
| Connectivity Interfaces (all functions are not available at the same time) | 2x USB2.0 OTG port with Phy | ✓ |
| | 1000/100/10 Mbps Gigabit Ethernet controller with support for EEE, Audio Video Bridging (AVB) and IEEE1588. | ✓ with on-board Gigabit PHY |
| | 1x PCIe Gen2 (1 lane) | ✓ |
| | QuadSPI with support for XIP | ✓ |
| | 5x I2S/SAI, SPDIF, 8-ch PDM | ✓ |
| | 2x SD3.0/MMC 5.0 | ✓ SD3 interface used on-board to eMMC, SD1 interface used when on-board Wi-Fi/BT mounted |
| | 3x SPI, 4x UART, 4x I²C | ✓ |

| | | |
|---|---|---|
| | PWMs, WDOG | ✓ |
| Other | PMIC (BD71847MWV) supporting DVFS techniques for low power modes | ✓ |
| | E2PROM storing board information and Ethernet MAC address | ✓ |
| | On-board RTC via PMIC (BD71847MWV) | ✓ |
| | On-board watchdog functionality | ✓ |

## 2.4 Reference Documents

The following documents are important reference documents and should be consulted when integrating the *iMX8M Mini uCOM board*:

- EACOM Board Specification
- EACOM Board Integration Manual

The following NXP documents are also important reference documents and should be consulted for functional details:

- IMX8MMCEC, i.MX 8M Mini Applications Processors - Consumer Products Data Sheet, latest revision
- IMX8MMIEC, i.MX 8M Mini Applications Processors - Industrial Products Data Sheet, latest revision
- IMX8MMRM, i.MX 8M Mini Applications Processors Reference Manual, latest revision
- IMX8MMSRM, Security Reference Manual for i.MX 8M Mini, latest revision
- IMX8MMCE, Chip Errata for the i.MX 8M Mini, latest revision
  **Note**: It is the user's responsibility to make sure all errata published by the manufacturer are taken note of. The manufacturer's advice should be followed.
- AN12410, i.MX 8M Mini Power Consumption Measurement, latest revision
- AN12468, i.MX 8M Mini Product Lifetime Usage, latest revision

The following documents are external industry standard reference documents and should also be consulted when applicable:

- eMMC (Embedded Multi-Media Card) the eMMC electrical standard is defined by JEDEC JESD84-B45 and the mechanical standard by JESD84-C44 (www.jedec.org)
- GbE MDI (Gigabit Ethernet Medium Dependent Interface) defined by IEEE 802.3. The 1000Base-T operation over copper twisted pair cabling is defined by IEEE 802.3ab (www.ieee.org)
- The I2C Specification, Version 2.1, January 2000, Philips Semiconductor (now NXP) (www.nxp.com)
- I2S Bus Specification, Feb. 1986 and Revised June 5, 1996, Philips Semiconductor (now NXP) (www.nxp.com)
- JTAG (Joint Test Action Group) defined by IEEE 1149.1-2001 - IEEE Standard Test Access Port and Boundary Scan Architecture (www.ieee.org)

- MXM3 Graphics Module Mobile PCI Express Module Electromechanical Specification, Version 3.0, Revision 1.1, © 2009 NVIDIA Corporation (www.mxm-sig.org)
- PCI Express Specifications (www.pci-sig.org)
- SD Specifications Part 1 Physical Layer Simplified Specification, Version 3.01, May 18, 2010, © 2010 SD Group and SD Card Association (Secure Digital) (www.sdcard.org)
- SPI Bus – “Serial Peripheral Interface” – de-facto serial interface standard defined by Motorola. A good description may be found on Wikipedia (http://en.wikipedia.org/wiki/Serial_Peripheral_Interface_Bus)
- DSI (Display Serial Interface) The DSI standard is owned and maintained by the MIPI Alliance (“Mobile Industry Processor Alliance”) (www.mipi.org)
- CSI-2 (Camera Serial Interface version 2) The CSI-2 standard is owned and maintained by the MIPI Alliance (“Mobile Industry Processor Alliance”) (www.mipi.org)
- USB Specifications (www.usb.org)

# 3 Board Pinning

Embedded Artists has defined the EAuCOM board standard with 42 x 45 mm boards that use Hirose DF40C connectors. Note that this is not the same as the EACOM board standard with module size 82 x 50 mm. Chapter 4 describes an adapter board that converts an EAuCOM board into an EACOM board. This way, the same carrier board can be used for all iMX Developer's Kits. See the *EAuCOM Board specification* document for details and background information. Hereafter this standard will be referred to as **EAuCOM**.

There are four Hirose DF40C expansion connectors; two 100 pos and two 40 pos connectors. The 0.4mm pitch connectors have a board-to-board stacking height of only 1.5mm. There are also versions of the receptacle connectors that give 3.0mm stacking height.

## 3.1 Pin Numbering

The figure below illustrates the location of the four expansion connectors and their respective pin numbering on the bottom side of the *iMX8M Mini uCOM Board*.

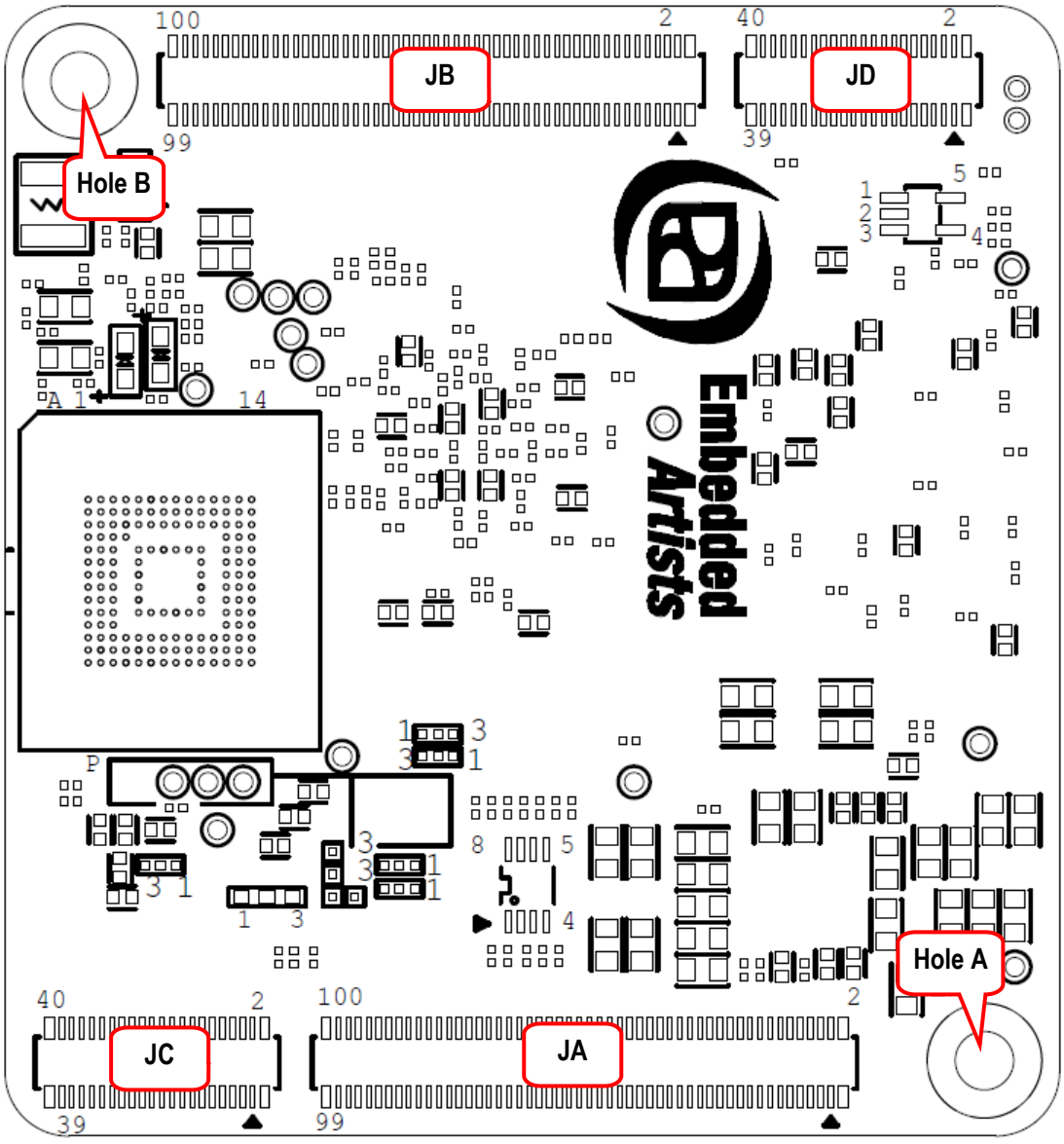


Figure 2 – iMX8M Mini uCOM (EAuCOM standard) Board Pin Numbering, Bottom Side

## 3.2 Pin Assignment

This section describes the pin assignment of the board, with the following columns:

| | |
|---|---|
| Connector and Pin number | The pin numbers are listed in consecutive order. Odd pin numbers are on one row and even numbers on the other row. |
| Non-i.MX 8M Mini signals | Lists signals that are not directly connected to the i.MX 8M Mini SoC. These signals are typically related to powering and connected to the on-board Power Management IC (PMIC), BD71847MWV. |
| i.MX 8M Mini Ball Name | The name of the ball of the i.MX 8M Mini SoC that is connected to this pin. |
| Alternative Pin Function | Information if the signal is a dedicated interface or a general pin that can multiples different signals. See separate Excel sheet for details about available multiplexing alternatives. |
| Notes | When relevant, the preferred pin function is listed. |

Note that some pins are EAuCOM board *type specific*, meaning that these pins might not be compatible with other EAuCOM boards. Using these may result in lost compatibility between EAuCOM boards, but not always. Check details between EAuCOM boards of interest.

The table below lists the pins on expansion connector JA (100-pos connector).

| JA Pin Number | EAuCOM Board Signal | i.MX 8M Mini Ball Name | Alternative Pin Function? | Notes |
|---|---|---|---|---|
| **1-8** | VIN_VBAT | PMIC: VSYS_4V2 | | System supply voltage, see chapter 8 for more details. |
| **9-16** | GND | | | |
| **17** | VDD1 | PMIC: LDO1 (NVCC_SNVS_1V8) | | Voltage rail, see chapter 8 for more details. |
| **18** | VDD_RTC | | | Not connected. On-board RTC powered via VIN. |
| **19, 21, 23, 25, 27, 29** | VDD_1V8 | PMIC: BUCK7 (NVCC_1V8) | | 1.8V voltage rail, see chapter 8 for more details. |
| **20, 22, 24, 26, 28, 30** | VDD_3V3 | PMIC: BUCK6 (NVCC_3V3) | | 3.3V voltage rail, see chapter 8 for more details. |
| **31-32** | GND | | | |
| **33** | Board specific | SAI1_MCLK | Yes | |
| **34, 36, 38, 40, 42** | VDD_RF | | | Not connected per default. Can optionally power on-board RF-module. Requires special order for this mounting option. |
| **35** | Board specific | SAI1_TXFS | Yes | |
| **37** | Board specific | SAI1_TXC | Yes | |
| **39** | Board specific | SAI1_TXD0 | Yes | |
| **41** | GND | | | |
| **43** | Board specific | SAI1_TXD1 | Yes | |
| **44** | GND | | | |
| **45** | Board specific | SAI1_TXD2 | Yes | |
| **46** | GND | | | |
| **47** | Board specific | SAI1_TXD3 | Yes | |
| **48** | VBAT_TEMP | - | | Not connected |
| **49** | Board specific | SAI1_TXD4 | Yes | |
| **50** | VBAT_CURRP | - | | Not connected |

| | | | | |
|---|---|---|---|---|
| **51** | GND | | | |
| **52** | VBAT_CURRN | - | | Not connected |
| **53** | Board specific | SAI1_TXD5 | Yes | |
| **54, 56, 58, 60** | PSU_5V | - | | Not connected |
| **55** | Board specific | SAI1_TXD6 | Yes | |
| **57** | Board specific | SAI1_TXD7 | Yes | |
| **59** | Board specific | SAI1_RXFS | Yes | |
| **61** | GND | | | |
| **62, 64, 66, 68** | VBUS_USB | - | | Not connected |
| **63** | Board specific | SAI1_RXC | Yes | |
| **65** | Board specific | SAI1_RXD0 | Yes | |
| **67** | Board specific | SAI1_RXD1 | Yes | |
| **69** | Board specific | SAI1_RXD2 | Yes | |
| **70-71** | GND | | | |
| **72** | Board specific | | No | |
| **73** | Board specific | SAI1_RXD3 | Yes | |
| **74** | Board specific | GPIO4 | | Internal signal connected to SD2_VSEL, controlling voltage level on SD2 interface. Do not connect to this signal. |
| **75** | Board specific | SAI1_RXD4 | Yes | |
| **76** | Board specific | - | | Not connected |
| **77** | Board specific | SAI1_RXD5 | Yes | |
| **78** | Board specific | SPDIF_TX | Yes | |
| **79** | Board specific | SAI1_RXD6 | Yes | |
| **80** | Board specific | SPDIF_RX | Yes | |
| **81-82** | GND | | | |
| **83** | Board specific | SAI1_RXD7 | Yes | |
| **84** | Board specific | SPDIF_EXT_CLK | Yes | |
| **85** | Board specific | SAI3_MCLK | Yes | |
| **86** | Board specific | SAI5_MCLK | Yes | |
| **87** | Board specific | SAI3_TXFS | Yes | |
| **88** | Board specific | SAI5_RXFS | Yes | |
| **89** | Board specific | SAI3_TXC | Yes | |
| **90** | Board specific | SAI5_RXC | Yes | |
| **91-92** | GND | | | |
| **93** | Board specific | SAI3_TXD | Yes | |
| **94** | Board specific | SAI5_RXD0 | Yes | |
| **95** | Board specific | SAI3_RXFS | Yes | |
| **96** | Board specific | SAI5_RXD1 | Yes | |
| **97** | Board specific | SAI3_RXC | Yes | |
| **98** | Board specific | SAI5_RXD2 | Yes | |
| **99** | Board specific | SAI3_RXD | Yes | |
| **100** | Board specific | SAI5_RXD3 | Yes | |

The table below lists the pins on expansion connector JB (100-pos connector).

| JB Pin Number | EAuCOM Board Signal | i.MX 8M Mini Ball Name | Alternative Pin Function? | Notes |
|---|---|---|---|---|
| 1 | UART-C_RXD | UART1_RXD | Yes | Not connected if Wi-Fi/BT module mounted |
| 2 | GPIO-A | GPIO0 | Yes | |
| 3 | UART-C_TXD | UART1_TXD | Yes | Not connected if Wi-Fi/BT module mounted |
| 4 | GPIO-B | GPIO1 | Yes | |
| 5 | UART-A_RXD | UART2_RXD | Yes | |
| 6 | GPIO-C | GPIO5 | Yes | |
| 7 | UART-A_TXD | UART2_TXD | Yes | |
| 8 | GPIO-D | GPIO6 | Yes | |
| 9 | UART-C_CTS | UART3_RXD | Yes | Not connected if Wi-Fi/BT module mounted |
| 10 | GPIO-E | GPIO7 | Yes | |
| 11 | UART-C_RTS | UART3_TXD | Yes | Not connected if Wi-Fi/BT module mounted |
| 12 | GPIO-F | GPIO8 | Yes | |
| 13 | UART-B_RXD | UART4_RXD | Yes | |
| 14 | GPIO-G | GPIO9 | Yes | |
| 15 | UART-B_TXD | UART4_TXD | Yes | |
| 16 | GPIO-H | GPIO11 | | Note. GPIO11 is only available on rev B1 boards, and later (when the new Ethernet-Phy was introduced, RTL8211FDI-CG, GPIO11 became available and was routed to this pin). |
| 17 | GND | | | |
| 18 | GPIO-J | - | | Not connected |
| 19 | SD-A_VDD | NVCC_SD2 | No | Supply voltage for SD2 interface.<br>Note: this is an output, not an input. No external load except pull-up resistors on the SD2 signals is allowed. |
| 20 | GPIO-K | - | Yes | |
| 21 | GND | | | |
| 22 | GPIO-L | SD2_VSEL | No | Internal signal connected to SD2_VSEL, controlling voltage level on SD2 interface. Do not connect to this signal. |
| 23 | SD-A_CLK | SD2_CLK | Yes | |
| 24 | GPIO-M | PMIC: CLK_32K_OUT | No | Connects to PMIC (BD71847MWV) CLK_32K_OUT output. Any external load on this signal can affect power consumption on deep-sleep mode. |
| 25 | SD-A_CMD | SD2_CMD | Yes | |
| 26 | GND | | | |
| 27 | SD-A_DATA0 | SD2_DATA0 | Yes | |
| 28 | SPI-A_SCLK | ECSPI1_SCLK | Yes | |
| 29 | SD-A_DATA1 | SD2_DATA1 | Yes | |
| 30 | SPI-A_MISO | ECSPI1_MISO | Yes | |
| 31 | SD-A_DATA2 | SD2_DATA2 | Yes | |
| 32 | SPI-A_MOSI | ECSPI1_MOSI | Yes | |
| 33 | SD-A_DATA3 | SD2_DATA3 | Yes | |
| 34 | SPI-A_SS0 | ECSPI1_SS0 | Yes | |

| | | | | |
|---|---|---|---|---|
| **35** | GND | | | |
| **36** | GND | | | |
| **37** | SD-A_WP | SD2_WP | Yes | Note: the logic level of this signal can be either 3.3V or 1.8V, depending on signal SD2_VSEL. This can change during run time. |
| **38** | SPI-B_SCLK | ECSPI2_SCLK | Yes | |
| **39** | SD-A_NCD | SD2_NCD | Yes | Note: the logic level of this signal can be either 3.3V or 1.8V, depending on signal SD2_VSEL. This can change during run time. |
| **40** | SPI-B_MISO | ECSPI2_MISO | Yes | |
| **41** | SD-A_NRST | SD2_NRST | Yes | Note: the logic level of this signal can be either 3.3V or 1.8V, depending on signal SD2_VSEL. This can change during run time. |
| **42** | SPI-B_MOSI | ECSPI2_MOSI | Yes | |
| **43** | USB-A_OC | GPIO13 | Yes | |
| **44** | SPI-B_SS0 | ECSPI2_SS0 | Yes | |
| **45** | USB-A_PWR | GPIO12 | Yes | |
| **46** | GND | | | |
| **47** | USB-A_VBUS | USB1_VBUS | No | |
| **48** | I2C-A_SCL | I2C1_SCL | No | Note: Do not change pin function. Must be an I2C channel since the interface is used on-board. |
| **49** | USB-A_DN | USB1_DN | No | |
| **50** | I2C-A_SDA | I2C1_SDA | No | Note: Do not change pin function. Must be an I2C channel since the interface is used on-board. |
| **51** | USB-A_DP | USB1_DP | No | |
| **52** | I2C-B_SCL | I2C2_SCL | Yes | The signal has an on-board 2.2Kohm pull-up resistor |
| **53** | USB-A_ID | USB1_ID | No | |
| **54** | I2C-B_SDA | I2C2_SDA | Yes | The signal has an on-board 2.2Kohm pull-up resistor |
| **55** | GND | | | |
| **56** | I2C-C_SCL | I2C3_SCL | Yes | The signal has an on-board 2.2Kohm pull-up resistor |
| **57** | USB-B_OC | GPIO14 | | |
| **58** | I2C-C_SDA | I2C3_SDA | Yes | The signal has an on-board 2.2Kohm pull-up resistor |
| **59** | USB-B_PWR | GPIO15 | | |
| **60** | I2C-D_SCL | I2C4_SCL | Yes | Note: this signal is also available on connector JD pin 33. The signal has no on-board pull-up resistor. |
| **61** | USB-B_VBUS | USB2_VBUS | No | |
| **62** | I2C-D_SDA | I2C4_SDA | Yes | The signal has no on-board pull-up resistor |
| **63** | USB-B_DN | USB2_DN | No | |
| **64** | GND | | | |
| **65** | USB-B_DP | USB2_DP | No | |
| **66** | GND | | | |
| **67** | USB-B_ID | USB2_ID | No | Not connected |
| **68** | PERI_PWR_EN | PMIC: BUCK6 (NVCC_3V3) | No | **Power enable signal for external peripherals. No external must drive any signal to the i.MX8M Mini SoC before this signal is active.**<br><br>The signal is active high and is connected to the on-board generate 3.3V supply rail. If all external circuits that can drive a signal to the i.MX8M Mini CPU are powered from the uCOM-generated 3.3V and 1.8V supplies, this gating signal |

| | | | | |
|---|---|---|---|---|
| | | | | can be ignored. |
| **69** | GND | | | |
| **70** | POR_B | POR_B | | Connected to POR_B on the i.MX 8M Mini SoC. Signal shall normally only be used to connect to debug interface connector. Use signals RESET_IN (JB pin 74) to cause a power cycle reset of the board. |
| **71** | ETH_LED_10/100 | ETH_LED_10/100 | | Connected to on-board Gigabit Ethernet PHY |
| **72** | ONOFF | ONOFF | | Connected to ONOFF on the i.MX 8M Mini SoC |
| **73** | ETH_LED_1000 | ETH_LED_1000 | | Connected to on-board Gigabit Ethernet PHY |
| **74** | PWRON_B | PMIC: PWRON_B | | A falling edge on this input cause a power cycle reset of the board. Connects to PMIC (BD71847MWV) PWRON_B input. |
| **75** | ETH_LED_ACT | ETH_LED_ACT | | Connected to on-board Gigabit Ethernet PHY |
| **76** | BOOT_MODE0 | BOOT_MODE0 | No | This signal shall be left unconnected under normal operation. The Boot Mode is controlled by signals ISP_ENABLE (JB pin 100) and BOOT_CTRL (JB pin 98).<br><br>Note. This signal is 1.8V logic level. |
| **77** | GND | | | |
| **78** | BOOT_MODE1 | BOOT_MODE1 | No | This signal shall be left unconnected under normal operation. The Boot Mode is controlled by signals ISP_ENABLE (JB pin 100) and BOOT_CTRL (JB pin 98).<br><br>Note. This signal is 1.8V logic level. |
| **79** | ETH_TRXP1 | ETH_TRXP1 | | Connected to on-board Gigabit Ethernet PHY |
| **80** | TEST_MODE | TEST_MODE | | Leave this signal unconnected |
| **81** | ETH_TRXN1 | ETH_TRXN1 | | Connected to on-board Gigabit Ethernet PHY |
| **82** | JTAG_VCC | PMIC: BUCK7 (NVCC_1V8) | | The supply voltage of the JTAG debug interface, 1.8V |
| **83** | GND | | | |
| **84** | GND | | | |
| **85** | ETH_TRXP0 | ETH_TRXP0 | | Connected to on-board Gigabit Ethernet PHY |
| **86** | JTAG_TCK | JTAG_TCK | No | |
| **87** | ETH_TRXN0 | ETH_TRXN0 | | Connected to on-board Gigabit Ethernet PHY |
| **88** | JTAG_TMS | JTAG_TMS | No | |
| **89** | GND | | | |
| **90** | JTAG_TDI | JTAG_TDI | No | |
| **91** | ETH_TRXN3 | ETH_TRXN3 | | Connected to on-board Gigabit Ethernet PHY |
| **92** | JTAG_TDO | JTAG_TDO | No | |
| **93** | ETH_TRXP3 | ETH_TRXP3 | | Connected to on-board Gigabit Ethernet PHY |
| **94** | JTAG_TRST | JTAG_TRST | No | |
| **95** | GND | | | |
| **96** | JTAG_MOD | JTAG_MOD | No | |
| **97** | ETH_TRXN2 | ETH_TRXN2 | | Connected to on-board Gigabit Ethernet PHY |
| **98** | BOOT_CTRL | | | Pull input low to ground to boot with configuration pullup/pulldown resistors. This is the default mode.<br><br>Connect this pin to the ground via a zero-ohm resistor. Never directly to ground. This would make it easy to leave the pin floating, if ever needed.<br><br>Leave floating/open to boot from OTP fuses (on the i.MX 8M Mini SoC). Note that the OTP fuses must first be |

| | | | | |
|---|---|---|---|---|
| | | | | programmed, typically via UUU.<br>See chapter 7 for more details about boot control and options. |
| **99** | ETH_TRXP2 | ETH_TRXP2 | | Connected to on-board Gigabit Ethernet PHY |
| **100** | ISP_ENABLE | | | Leave floating/open for normal boot.<br>Pull low to ground to place i.MX 8M Mini SoC in USB OTG boot mode (during next power cycle). See chapter 7 for more detail about boot control and options. |

The table below lists the pins on expansion connector JC (40-pos connector). **Note that this connector is typically not mounted if the Murata Wi-Fi/BT module is mounted (because most signals available on this connector are all used to connect to the Wi-Fi/BT module).**

| JC Pin Number | EAuCOM Board Signal | i.MX 8M Mini Ball Name | Alternative Pin Function? | Notes |
|---|---|---|---|---|
| **1** | SD-B_VCC | NVCC_SD1_EXT | | The SD1 interface is powered with 1.8V as default.<br>This signal can optionally control voltage level on the SD1 interface.<br>Note: requires a special order for this feature/mounting option. |
| **2** | GND | | | |
| **3** | SD-B_CLK | SD1_CLK | Yes | Note. This signal is 1.8V logic level. |
| **4** | Board specific | - | | Not connected |
| **5** | SD-B_CMD | SD1_CMD | Yes | Note. This signal is 1.8V logic level. |
| **6** | Board specific | - | | Not connected |
| **7** | SD-B_DATA0 | SD1_DATA0 | Yes | Note. This signal is 1.8V logic level. |
| **8** | Board specific | - | | Not connected |
| **9** | SD-B_ DATA1 | SD1_DATA1 | Yes | Note. This signal is 1.8V logic level. |
| **10** | Board specific | - | | Not connected |
| **11** | SD-B_ DATA2 | SD1_DATA2 | Yes | Note. This signal is 1.8V logic level. |
| **12** | GND | | | |
| **13** | SD-B_ DATA3 | SD1_DATA3 | Yes | Note. This signal is 1.8V logic level. |
| **14** | Board specific | - | | Not connected |
| **15** | Board specific | SD1_DATA4 | Yes | Note. This signal is 1.8V logic level. |
| **16** | Board specific | - | | Not connected |
| **17** | Board specific | SD1_DATA5 | Yes | Note. This signal is 1.8V logic level. |
| **18** | Board specific | - | | Not connected |
| **19** | Board specific | SD1_DATA6 | Yes | Note. This signal is 1.8V logic level. |
| **20** | Board specific | - | | Not connected |
| **21** | Board specific | SD1_DATA7 | Yes | Note. This signal is 1.8V logic level. |
| **22** | GND | | | |
| **23** | Board specific | SD1_NRST | Yes | Note. This signal is 1.8V logic level. |
| **24** | Board specific | - | | Not connected |
| **25** | Board specific | SD1_STROBE | Yes | Note. This signal is 1.8V logic level. |
| **26** | Board specific | PMIC: BUCK7 (NVCC_1V8) | | Power supply for external QSPI memory |
| **27** | SAI_TXFS | SAI2_TXFS | Yes | Note. This signal is 1.8V logic level. |
| **28** | Board specific | NAND_CE0_B/ QSPIA_NSS0 | Yes | Note. This signal is 1.8V logic level. |

| | | | | |
|---|---|---|---|---|
| **29** | SAI_TXD | SAI2_TXD | Yes | Note. This signal is 1.8V logic level. |
| **30** | Board specific | NAND_ALE/ QSPIA_SCLK | Yes | Note. This signal is 1.8V logic level. |
| **31** | SAI_TXC | SAI2_TXC | Yes | Note. This signal is 1.8V logic level. |
| **32** | GND | | | |
| **33** | SAI_RXD | SAI2_RXD | Yes | Note. This signal is 1.8V logic level. |
| **34** | Board specific | NAND_DATA00/ QSPIA_DATA0 | Yes | Note. This signal is 1.8V logic level. |
| **35** | Board specific | SAI2_RXFS | Yes | Note. This signal is 1.8V logic level. |
| **36** | Board specific | NAND_DATA01/ QSPIA_DATA1 | Yes | Note. This signal is 1.8V logic level. |
| **37** | Board specific | SAI2_RXC | Yes | Note. This signal is 1.8V logic level. |
| **38** | Board specific | NAND_DATA02/ QSPIA_DATA2 | Yes | Note. This signal is 1.8V logic level. |
| **39** | Board specific | SAI2_MCLK | Yes | Note. This signal is 1.8V logic level. |
| **40** | Board specific | NAND_DATA03/ QSPIA_DATA3 | Yes | Note. This signal is 1.8V logic level. |

The table below lists the pins on expansion connector JD (40-pos connector).

| JD Pin Number | EAuCOM Board Signal | i.MX 8M Mini Ball Name | Alternative Pin Function? | Notes |
|---|---|---|---|---|
| **1** | DSI_DN3 | DSI_DN3 | No | |
| **2** | CSI_CKN | CSI_CKN | No | |
| **3** | DSI_DP3 | DSI_DP3 | No | |
| **4** | CSI_CKP | CSI_CKP | No | |
| **5** | GND | | | |
| **6** | GND | | | |
| **7** | DSI_DN0 | DSI_DN0 | No | |
| **8** | CSI_DN0 | CSI_DN0 | No | |
| **9** | SDI_DP0 | SDI_DP0 | No | |
| **10** | CSI_DP0 | CSI_DP0 | No | |
| **11** | GND | | | |
| **12** | GND | | | |
| **13** | DSI_DN2 | DSI_DN2 | No | |
| **14** | CSI_DN1 | CSI_DN1 | No | |
| **15** | DSI_DP2 | DSI_DP2 | No | |
| **16** | CSI_DP1 | CSI_DP1 | No | |
| **17** | GND | | | |
| **18** | GND | | | |
| **19** | DSI_DN1 | DSI_DN1 | No | |
| **20** | CSI_DN2 | CSI_DN2 | No | |
| **21** | DSI_DP1 | DSI_DP1 | No | |
| **22** | CSI_DP2 | CSI_DP2 | No | |
| **23** | GND | | | |

| | | | | |
|---|---|---|---|---|
| **24** | GND | | | |
| **25** | DSI_CKN | DSI_CKN | No | |
| **26** | CSI_DN3 | CSI_DN3 | No | |
| **27** | DSI_CKP | DSI_CKP | No | |
| **28** | CSI_DP3 | CSI_DP3 | No | |
| **29** | GND | | | |
| **30** | GND | | | |
| **31** | Board specific | - | | Not connected |
| **32** | PCIE_RXN | PCIE_RXN | No | |
| **33** | PCIE_CLKREQ_B | I2C4_SCL/ PCIE_CLKREQ_B | Yes | Note: this signal is also available on connector JB pin 60. |
| **34** | PCIE_RXP | PCIE_RXP | No | |
| **35** | GND | | | |
| **36** | GND | | | |
| **37** | PCIE_CLKN | PCIE_CLKN | No | |
| **38** | PCIE_TXN | PCIE_TXN | No | |
| **39** | PCIe_CLKP | PCIe_CLKP | No | |
| **40** | PCIE_TXP | PCIE_TXP | No | |

# 4 iMX Developer's Kit V2 – uCOM Adapter Board

This chapter is only relevant if you have an iMX8M Mini uCOM Developer's Kit V2. In that case, a uCOM Adapter Board is needed and this chapter presents this board. **Skip this chapter if you have an iMX8M Mini uCOM Developer's Kit V3.**

Embedded Artists has defined the EACOM board standard that is based on the SMARC form factor; module size 82 x 50 mm. Note that pinning is different from the SMARC standard. See the *EACOM Board specification* document for details and background information. Hereafter this standard will be referred to as **EACOM**.

Embedded Artists has also defined the **EAuCOM** board standard with 42 x 45 mm boards that use Hirose DF40C connectors. The *uCOM Adapter Board* has been designed to convert an EAuCOM board into an EACOM board. This way, the same carrier board can be used for all *iMX Developer's Kits*.

The *iMX8M Mini uCOM Developers Kit V2* consists of:

- One *iMX8M Mini uCOM Board, mounted on*
- One *uCOM Adapter Board*, mounted on
- One *COM Carrier Board V2*

The *uCOM Adapter Board* contains the following functions (see schematic for details):

- MIPI-DSI to HDMI bridge
- MIPI-DSI interface directly to LCD, including backlight LED driver and touch interface
- Boot control
- Battery connector
- JTAG connector
- Optional 3.6V RF supply voltage for uCOM boards with on-board Wi-Fi/BT module
- Possibility to measure input and output currents on supply nets
- Voltage level translation on some signals
- USB multiplexor (for iMX8M Mini, which only have one USB interface)

The carrier board connector has 314 pins with 0.5 mm pitch and the *uCOM Adapter Board* is inserted in a right angle (R/A) style. The connector is originally defined for use with MXM3 graphics cards. There are multiple sources for carrier board (MXM3) connectors due to the popular standard. The signal integrity is excellent and suitable for data rates up to 5 GHz.

## 4.1 Pin Numbering

The figures below show the pin numbering for *uCOM Adapter Board*, which is compatible with EACOM boards. Top side edge fingers are numbered P1-P156. Bottom side edge fingers are numbered S1-S158. There is an alternative pin numbering that follows the MXM3 standard with even numbers on the bottom and odd numbers on the top. This numbering is from 1-321, with 7 numbers/pins (150-156) removed due to the keying.

The picture below also illustrates where the *iMX8M Mini uCOM board* is mounted on the *uCOM Adapter Board*.

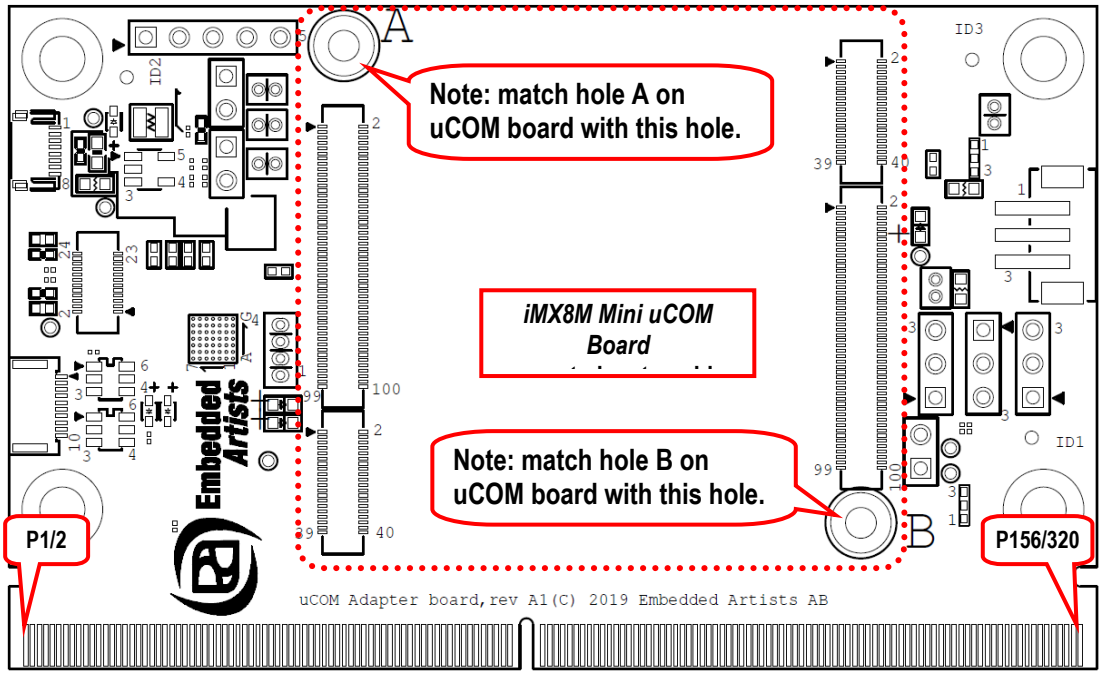


Figure 3 – uCOM Adapter Board Pin Numbering, Top Side

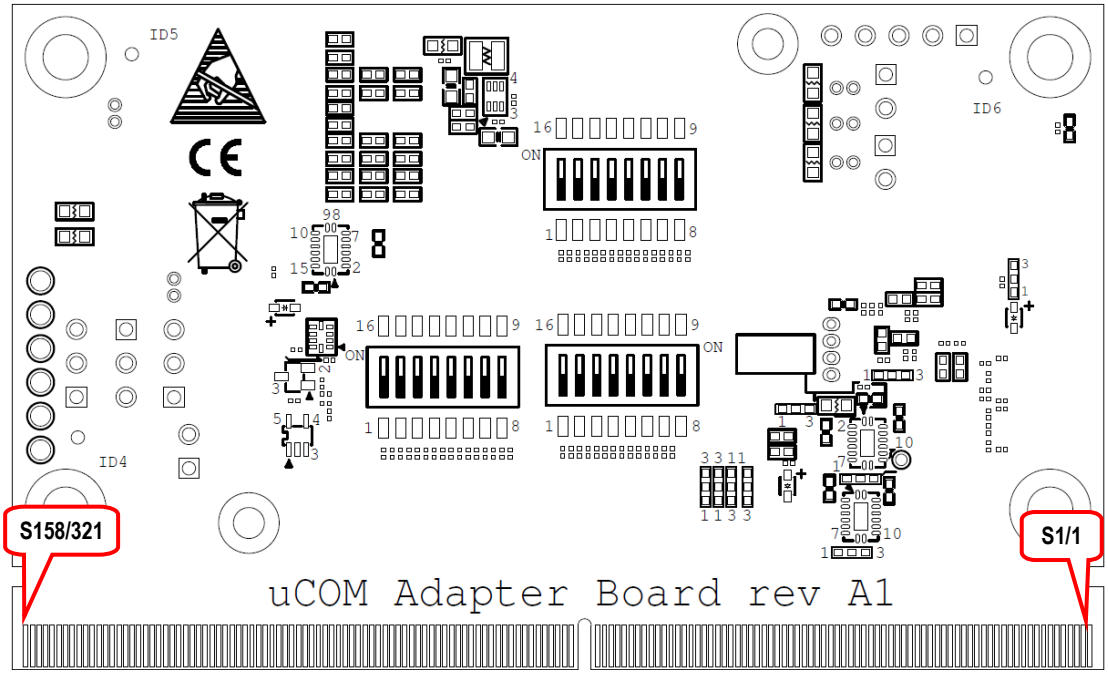


Figure 4 – uCOM Adapter Board Pin Numbering, Bottom Side

## 4.2 Pin Assignment

This section describes the pin assignment of the board, with the following columns:

| | |
|---|---|
| Pin number | **Px** are top side edge fingers. **Sx** are bottom side edge fingers. An alternative, consecutive, numbering is also shown with odd numbers on the top and even numbers on the bottom side. |

| | |
|---|---|
| EACOM Board | Describe the typical usage of the pin according to EACOM. This pin usage should be followed to get compatibility between different COM boards. If this is not needed, then any of the alternative functions on the pin can also be used. |
| i.MX 8M Mini Ball Name | The name of the ball of the i.MX 8M Mini SoC (or other component on the uCOM board) that is connected to this pin. |
| Notes | When relevant, the preferred pin function is listed. |

There are 45 ground pins, which equal to about 15%, and 10 input voltage supply pins.

Note that some pins are EACOM board *type specific*, meaning that these pins might not be compatible with other EACOM boards. Using these may result in lost compatibility between EACOM boards, but not always. Check details between EACOM boards of interest.

Note that not all EACOM-defined pins are connected on anything, typically because an interface is not supported or there are not enough free pins in the i.MX 8M Mini SoC.

Further, some pins are *COM board type specific*, meaning that these pins might not be compatible with other EACOM boards. Using *type specific* pins may result in lost compatibility between EACOM boards, but not always. Check details between EACOM boards of interest.

The table below lists the top side pins, P1-P156, odd numbers.

| Top Side Pin Number | EAuCOM Board | EACOM Board | i.MX 8M Mini Ball Name | Alternative pin functions? | Notes |
|---|---|---|---|---|---|
| P1/2 | JC pin 025 SD-B_STROBE | GPIO-F | SD1_STROBE | Yes | Via 3.3V to 1.8V level translator<br>Hardwired as output from uCOM board (via U7 on uCOM Adapter board)<br>**Note**: Signal has 1.8V logic level. |
| P2/4 | JD pin 033 | GPIO-E | I2C4_SCL | Yes | Note: this signal is also available on pin P116/240. The signal has no on-board pull-up resistor. |
| P3/6 | JB pin 039 SD-A_NCD | GPIO-D | SD2_NCD | Yes | **Note**: If NVCC_SD2 is 1.8V, the logic level of this signal will be 1.8V (and not 3.3V). NVCC_SD2 will be 1.8V when accessing an ultra-high speed SD memory card. |
| P4/8 | JB pin 041 SD-A_NRST | GPIO-C | SD2_NRST | Yes | **Note**: If NVCC_SD2 is 1.8V, the logic level of this signal will be 1.8V (and not 3.3V). NVCC_SD2 will be 1.8V when accessing an ultra-high speed SD memory card. |
| P5/10 | JC pin 009 SD-B_DATA1 | SD_D1 | SD1_DATA1 | Yes | **Note**: Signal has 1.8V logic level. |
| P6/12 | JC pin 007 SD-B_DATA0 | SD_D0 | SD1_DATA0 | Yes | **Note**: Signal has 1.8V logic level. |
| P7/14 | JC pin 003 SD-B_CLK | SD_CLK | SD1_CLK | Yes | **Note**: Signal has 1.8V logic level. |
| P8/16 | JC pin 005 SD-B_CMD | SD_CMD | SD1_CMD | Yes | **Note**: Signal has 1.8V logic level. |
| P9/18 | JC pin 013 SD-B_DATA3 | SD_D3 | SD1_DATA3 | Yes | **Note**: Signal has 1.8V logic level. |
| P10/20 | JC pin 011 SD-B_DATA2 | SD_D2 | SD1_DATA2 | Yes | **Note**: Signal has 1.8V logic level. |
| P11/22 | JB pin 019 NVCC_SD | SD_VCC | NVCC_SD2 | | Supply voltage for SD2 interface (1.8V or 3.3V). This is an output but should never be used to anything else than the SD2 interface. |
| P12/24 | JB pin 029 SD-A_DATA1 | MMC_D1 | SD2_DATA1 | Yes | **Note**: Logic level (3.3V or 1.8V depends on NVCC_SD, which is controlled by the Linux BSP. |
| P13/26 | JB pin 027 SD-A_DATA0 | MMC_D0 | SD2_DATA0 | Yes | **Note**: Logic level (3.3V or 1.8V depends on NVCC_SD, which is controlled by the Linux BSP. |

| | | | | | |
|---|---|---|---|---|---|
| P14/28 | Not connected | MMC_D7 | | | Not connected |
| P15/30 | Not connected | MMC_D6 | | | Not connected |
| P16/32 | JB pin 023 SD-A_CLK | MMC_CLK | SD2_CLK | Yes | **Note**: Logic level (3.3V or 1.8V depends on NVCC_SD, which is controlled by the Linux BSP. |
| P17/34 | Not connected | MMC_D5 | | | Not connected |
| P18/36 | JB pin 025 SD-A_CMD | MMC_CMD | SD2_CMD | Yes | **Note**: Logic level (3.3V or 1.8V depends on NVCC_SD, which is controlled by the Linux BSP. |
| P19/38 | Not connected | MMC_D4 | | | Not connected |
| P20/40 | JB pin 033 SD-A_DATA3 | MMC_D3 | SD2_DATA3 | Yes | **Note**: Logic level (3.3V or 1.8V depends on NVCC_SD, which is controlled by the Linux BSP. |
| P21/42 | JB pin 031 SD-A_DATA2 | MMC_D2 | SD2_DATA2 | Yes | **Note**: Logic level (3.3V or 1.8V depends on NVCC_SD, which is controlled by the Linux BSP. |
| P22/44 | | GND | | | |
| P23/46 | | HDMI_TXC_N | | | Connected to DSI-to-HDMI bridge (ADV7533) on uCOM Adapter |
| P24/48 | | HDMI_TXC_P | | | Connected to DSI-to-HDMI bridge (ADV7533) on uCOM Adapter |
| P25/50 | | GND | | | |
| P26/52 | | HDMI_TXD0_N | | | Connected to DSI-to-HDMI bridge (ADV7533) on uCOM Adapter |
| P27/54 | | HDMI_TXD0_P | | | Connected to DSI-to-HDMI bridge (ADV7533) on uCOM Adapter |
| P28/56 | | HDMI_HPD | | | Connected to DSI-to-HDMI bridge (ADV7533) on uCOM Adapter |
| P29/58 | | HDMI_TXD1_N | | | Connected to DSI-to-HDMI bridge (ADV7533) on uCOM Adapter |
| P30/60 | | HDMI_TXD1_P | | | Connected to DSI-to-HDMI bridge (ADV7533) on uCOM Adapter |
| P31/62 | | GND | | | |
| P32/64 | | HDMI_TXD2_N | | | Connected to DSI-to-HDMI bridge (ADV7533) on uCOM Adapter |
| P33/66 | | HDMI_TXD2_P | | | Connected to DSI-to-HDMI bridge (ADV7533) on uCOM Adapter |
| P34/68 | | HDMI_CEC | | | No connection |
| P35/70 | | GND | | | |
| P36/72 | JB pin 079 ETH_TRXP1 | ETH1_MD1_P | ETH1_MD1_P | | |
| P37/74 | JB pin 081 ETH_TRXN1 | ETH1_MD1_N | ETH1_MD1_N | | |
| P38/76 | | GND | | | |
| P39/78 | JB pin 085 ETH_TRXP0 | ETH1_MD0_P | ETH1_MD0_P | | |
| P40/80 | JB pin 087 ETH_TRXN0 | ETH1_MD0_N | ETH1_MD0_N | | |
| P41/82 | JB pin 073 ETH_LED_1000 | ETH1_LINK1000 | ETH1_LINK1000 | | |
| P42/84 | JB pin 075 ETH_LED_ACT | ETH1_ACT | ETH1_ACT | | |
| P43/86 | JB pin 071 ETH_LED_10_100 | ETH1_LINK | ETH1_LINK | | |

| | | | | | |
|---|---|---|---|---|---|
| P44/88 | JB pin 091<br>ETH_TRXN3 | ETH1_MD3_N | ETH1_MD3_N | | |
| P45/90 | JB pin 093<br>ETH_TRXP3 | ETH1_MD3_P | ETH1_MD3_P | | |
| P46/92 | | GND | | | |
| P47/94 | JB pin 097<br>ETH_TRXN2 | ETH1_MD2_N | ETH1_MD2_N | | |
| P48/96 | JB pin 099<br>ETH_TRXP2 | ETH1_MD2_P | ETH1_MD2_P | | |
| P49/98 | | GND | | | |
| P50/100 | Not connected | ETH2_MD1_P | | | |
| P51/102 | Not connected | ETH2_MD1_N | | | |
| P52/104 | | GND | | | |
| P53/106 | Not connected | ETH2_MD0_P | | | |
| P54/108 | Not connected | ETH2_MD0_N | | | |
| P55/110 | Not connected | ETH2_LINK1000 | | | |
| P56/112 | Not connected | ETH2_ACT | | | |
| P57/114 | Not connected | ETH2_LINK | | | |
| P58/116 | Not connected | ETH2_MD3_N | | | |
| P59/118 | Not connected | ETH2_MD3_P | | | |
| P60/120 | | GND | | | |
| P61/122 | Not connected | ETH2_MD2_N | | | |
| P62/124 | Not connected | ETH2_MD2_P | | | |
| P63/126 | | GND | | | |
| P64/128 | JB pin 049<br>USB-A_DN | USB_O1_DN | USB1_DN | No | |
| P65/130 | JB pin 051<br>USB-A_DP | USB_O1_DP | USB1_DP | No | |
| P66/132 | JB pin 053<br>USB-A_ID | USB_O1_OTG_ID | USB1_ID | Yes | |
| P67/134 | Not connected | USB_O1_SSTXN | | | Not connected |
| P68/136 | Not connected | USB_O1_SSTXP | | | Not connected |
| P69/138 | | GND | | | |
| P70/140 | Not connected | USB_O1_SSRXN | | | Not connected |
| P71/142 | Not connected | USB_O1_SSRXP | | | Not connected |
| P72/144 | JB pin 047<br>USB-A_VBUS | USB_O1_VBUS | USB1_VBUS | No | |
| P73/146 | JB pin 045<br>USB-A_PWR | USB_O1_PWR_EN | GPIO12 | Yes | |
| P74/148 | JB pin 043<br>USB-A_OC | USB_O1_OC | GPIO13 | Yes | |
| 150 | | Non existing pin | | | |
| 152 | | Non existing pin | | | |
| 154 | | Non existing pin | | | |
| 156 | | Non existing pin | | | |
| P75/158 | JB pin 059<br>USB-B_PWR | USB_H1_PWR_EN | GPIO15 | Yes | Note: According to the EAuCOM pinning standard, this signal has been allocation to the power-enable output for the USB2 interface. GPIO15 do not have this alternative |

| | | | | | |
|---|---|---|---|---|---|
| | | | | | pin function. However, it has USB2_OTG_OC. Allocate the power-enable output as a GPIO output in the Linux *.dts file. |
| P76/160 | JB pin 057<br>USB-B_OC | USB_H1_OC | GPIO14 | Yes | Note: According to the EAuCOM pinning standard, this signal has been allocation to the over-current input for the USB2 interface. GPIO14 do not have this alternative pin function. However, it has USB2_OTG_PWR. Allocate the over-current input as a GPIO input in the Linux *.dts file. |
| P77/162 | | GND | | | |
| P78/164 | JB pin 063<br>USB-B_DN | USB_H1_DN | USB2_DN | No | |
| P79/166 | JB pin 065<br>USB-B_DP | USB_H1_DP | USB2_DP | No | |
| P80/168 | Not connected | USB_H1_SSTXN | | | Not connected |
| P81/170 | Not connected | USB_H1_SSTXP | | | Not connected |
| P82/172 | | GND | | | |
| P83/174 | Not connected | USB_H1_SSRXN | | | Not connected |
| P84/176 | Not connected | USB_H1_SSRXP | | | Not connected |
| P85/178 | JB pin 061<br>USB-B_VBUS | USB_H1_VBUS | USB2_VBUS | No | |
| P86/180 | JA pin 072<br>Board specific | USB_H2_PWR_EN | | | Not connected |
| P87/182 | JB pin 072<br>ONOFF | USB_H2_OC | ONOFF | No | |
| P88/184 | | GND | | | Not connected |
| P89/186 | Not connected | USB_H2_DN | | | Not connected |
| P90/188 | Not connected | USB_H2_DP | | | Not connected |
| P91/190 | | GND | | | |
| P92/192 | JC pin 015<br>SD-B_DATA4 | COM board specific | SD1_DATA4 | Yes | **Note**: Signal has 1.8V logic level. |
| P93/194 | JC pin 017<br>SD-B_DATA5 | COM board specific | SD1_DATA5 | Yes | **Note**: Signal has 1.8V logic level. |
| P94/196 | JC pin 023<br>SD-B_NRST | COM board specific | SD1_NRST | Yes | **Note**: Signal has 1.8V logic level. |
| P95/198 | Not connected | COM board specific | | | Not connected |
| P96/200 | Not connected | COM board specific | | | Not connected |
| P97/202 | Not connected | COM board specific | | | Not connected |
| P98/204 | Not connected | COM board specific | | | Not connected |
| P99/206 | Not connected | COM board specific | | | Not connected |
| P100/208 | Not connected | COM board specific | | | Not connected |
| P101/210 | Not connected | COM board specific | | | Not connected |
| P102/212 | Not connected | COM board specific | | | Not connected |
| P103/214 | Not connected | COM board specific | | | Not connected |
| P104/216 | Not connected | COM board specific | | | Not connected |
| P105/218 | Not connected | COM board specific | | | Not connected |
| P106/220 | Not connected | COM board specific | | | Not connected |
| P107/222 | Not connected | COM board specific | | | Not connected |
| P108/224 | Not connected | COM board specific | | | Not connected |

| | | | | | |
|---|---|---|---|---|---|
| P109/226 | Not connected | COM board specific | | | Not connected |
| P110/228 | JB pin 058<br>I2C-C_SDA | COM board specific | I2C3_SDA | Yes | **Note**: signal has a 2.2Kohm pull-up resistor to 3.3V |
| P111/230 | JB pin 056<br>I2C-C_SCL | COM board specific | I2C3_SCL | Yes | **Note**: signal has a 2.2Kohm pull-up resistor to 3.3V |
| P112/232 | Not connected | COM board specific | | | Not connected |
| P113/234 | JB pin 012<br>GPIO-F | COM board specific | GPIO8 | Yes | |
| P114/236 | Not connected | COM board specific | | | Not connected |
| P115/238 | JB pin 062<br>I2C-D_SDA | COM board specific | I2C4_SDA | Yes | **Note**: The signal has no on-board pull-up resistor. |
| P116/240 | JB pin 060<br>I2C-D_SCL | COM board specific | I2C4_SCL | Yes | **Note**: this signal is also available on pin P2/4.<br>The signal has no on-board pull-up resistor. |
| P117/242 | JB pin 002<br>GPIO-A | COM board specific | GPIO0 | Yes | |
| P118/244 | | GND | | | |
| P119/246 | JB pin 044<br>SPI-B_SSEL | SPI-B_SSEL | ECSPI2_SS0 | Yes | |
| P120/248 | JB pin 042<br>SPI-B_MOSI | SPI-B_MOSI | ECSPI2_MOSI | Yes | |
| P121/250 | JB pin 040<br>SPI-B_MISO | SPI-B_MISO | ECSPI2_MISO | Yes | |
| P122/252 | JB pin 038<br>SPI-B_CLK | SPI-B_CLK | ECSPI2_SCLK | Yes | |
| P123/254 | JB pin 034<br>SPI-A_SSEL | SPI-A_SSEL | ECSPI1_SS0 | Yes | |
| P124/256 | JB pin 032<br>SPI-A_MOSI | SPI-A_MOSI | ECSPI1_MOSI | Yes | |
| P125/258 | JB pin 030<br>SPI-A_MISO | SPI-A_MISO | ECSPI1_MISO | Yes | |
| P126/260 | JB pin 028<br>SPI-A_CLK | SPI-A_CLK | ECSPI1_SCLK | Yes | |
| P127/262 | | GND | | | |
| P128/264 | JB pin 013<br>UART-C_RXD | UART-C_RXD | UART4_RXD | Yes | |
| P129/266 | JB pin 015<br>UART-C_TXD | UART-C_TXD | UART4_TXD | Yes | |
| P130/268 | JB pin 001<br>UART-B_RXD | UART-B_RXD | UART1_RXD | Yes | |
| P131/270 | JB pin 009<br>UART-B_CTS | UART-B_CTS | UART3_RXD | Yes | |
| P132/272 | JB pin 011<br>UART-B_RTS | UART-B_RTS | UART3_TXD | Yes | |
| P133/274 | JB pin 003<br>UART-B_TXD | UART-B_TXD | UART1_TXD | Yes | |
| P134/276 | JB pin 005<br>UART-A_RXD | UART-A_RXD | UART2_RXD | Yes | |
| P135/278 | JB pin 018<br>GPIO-J | UART-A_CTS | | | Not connected |
| P136/280 | JB pin 016<br>GPIO-H | UART-A_RTS | | | Not connected |
| P137/282 | JB pin 007 | UART.A_TXD | UART2_TXD | Yes | |

| | | | | | |
|---|---|---|---|---|---|
| | UART-A_TXD | | | | |
| P138/284 | JB pin 004<br>GPIO-B | PWM | GPIO1 | Yes | |
| P139/286 | JC pin 019<br>SD-B_DATA6 | GPIO-B | SD1_DATA6 | Yes | Via 3.3V to 1.8V level translator<br>Hardwired as input to uCOM board (via U7 on uCOM Adapter board)<br>**Note**: Signal has 1.8V logic level. |
| P140/288 | JC pin 021<br>SD-B_DATA7 | GPIO-A | SD1_DATA7 | Yes | Via 3.3V to 1.8V level translator<br>Hardwires as input to uCOM board (via D7 on uCOM Adapter board)<br>**Note**: Signal has 1.8V logic level. |
| P141/290 | JB pin 068 | PERI_PWR_EN | PMIC: BUCK6 (NVCC_3V3) | No | Enable signal (active high) for carrier board peripheral power supplies. More information about carrier board design can be found in *EACOM Board specification*.<br>**Power enable signal for external peripherals. No external must drive any signal to the i.MX8M Mini SoC before this signal is active.**<br>This signal is connected to the on-board generated 3.3V supply rail. |
| P142/292 | JB pin 074<br>RESET_IN | RESET_IN | PMIC: PWRON_B | | Reset input, active low. A falling edge on this input cause a power cycle reset of the board. There is no need to pull signal high externally. Connects to PMIC (BD71847MWV) PWRON_B input. |
| P143/294 | | RESET_OUT | Copy of POR_B | | Reset (open drain) output, active low. Driven low during reset. Has a 10Kohm pull-up resistor to on-board generated 3.3V supply. |
| P144/296 | | VIN_SELECT | | | This output is connected to VIN via a 1Kohm resistor to signal that supply voltage VIN shall be 4.2V.<br>This is for carrier boards that can support EACOM boards that require 3.3V on VIN (in this case, this pin is connected to ground). |
| P145/298 | JA pin 018<br>VBAT_RTC | VBAT_RTC | | | Supply voltage from coin cell battery for keeping PMIC and RTC functioning during standby. |
| P146/300 | JB pin 100<br>ISP_ENABLE | ISP_ENABLE | | | Should be left open (will write protect the on-board parameter storage E2PROM), or connected to GND (will enable writes to the on-board parameter storage E2PROM and place the i.MX 8M Mini SoC in USB OTG boot mode after a power cycle). |
| P147/302<br>P148/304<br>P149/306<br>P150/308<br>P151/310<br>P152/312<br>P153/314<br>P154/316<br>P155/318<br>P156/320 | JA pin 001<br>JA pin 002<br>JA pin 003<br>JA pin 004<br>JA pin 005<br>JA pin 006<br>JA pin 007<br>JA pin 008 | VIN | | | Main input voltage supply (4.2V) |

The table below lists the bottom side pins, S1-S158, even numbers.

| Bottom Side Pin Number | EAuCOM Board | EACOM Board | i.MX 8M Mini Ball Name | Alternative pin functions? | Notes |
|---|---|---|---|---|---|
| **S1/1** | JC pin 035 SAI_RXFS | MQS_RIGHT | SAI2_RXFS | Yes | |
| **S2/3** | JC pin 037 SAI_RXC | MQS_LEFT | SAI2_RXC | Yes | |
| **S3/5** | | GND | | | |
| **S4/7** | JC pin 027 SAI_TXFS | AUDIO_TXFS | SAI2_TXFS | Yes | |
| **S5/9** | JC pin 033 SAI_RXD | AUDIO_RXD | SAI2_RXD0 | Yes | |
| **S6/11** | JC pin 031 SAI_TXC | AUDIO_TXC | SAI2_TXC | Yes | |
| **S7/13** | JC pin 029 SAI_TXD | AUDIO_TXD | SAI2_TXD0 | Yes | |
| **S8/15** | JC pin 039 SAI_MCLK | AUDIO_MCLK | SAI2_MCLK | Yes | |
| **S9/17** | | GND | | | |
| **S10/19** | JA pin 080 SPDIF_RX | SPDIF_IN | SPDIF_RX | Yes | |
| **S11/21** | JA pin 078 SPDIF_TX | SPDIF_OUT | SPDIF_TX | Yes | |
| **S12/23** | JB pin 022 GPIO-L | CAN2_TX | GPIO4 (SD2_VSEL) | No | Internal signal connected to SD2_VSEL, controlling voltage level on SD2 interface. Do not connect to this signal. |
| **S13/25** | JB pin 020 GPIO-K | CAN2_RX | | | Not connected |
| **S14/27** | JA pin 074 Board specific | CAN1_TX | GPIO4 (SD2_VSEL) | No | Internal signal connected to SD2_VSEL, controlling voltage level on SD2 interface. Do not connect to this signal. |
| **S15/29** | JA pin 076 Board specific | CAN1_RX | | | Not connected |
| **S16/31** | | GND | | | |
| **S17/33** | Not connected | LVDS1_D3_P | | | Not connected |
| **S18/35** | Not connected | LVDS1_D3_N | | | Not connected |
| **S19/37** | Not connected | GPIO-J | | | Not connected |
| **S20/39** | Not connected | LVDS1_D2_P | | | Not connected |
| **S21/41** | Not connected | LVDS1_D2_N | | | Not connected |
| **S22/43** | | GND | | | |
| **S23/45** | Not connected | LVDS1_D1_P | | | Not connected |
| **S24/47** | Not connected | LVDS1_D1_N | | | Not connected |
| **S25/49** | | GND | | | |
| **S26/51** | Not connected | LVDS1_D0_P | | | Not connected |
| **S27/53** | Not connected | LVDS1_D0_N | | | Not connected |
| **S28/55** | | GND | | | |
| **S29/57** | Not connected | LVDS1_CLK_P | | | Not connected |
| **S30/59** | Not connected | LVDS1_CLK_N | | | Not connected |

| | | | | | |
|---|---|---|---|---|---|
| **S31/61** | | GND | | | |
| **S32/63** | Not connected | LVDS0_D3_P | | | Not connected |
| **S33/65** | Not connected | LVDS0_D3_N | | | Not connected |
| **S34/67** | Not connected | GPIO-H | | | Not connected |
| **S35/69** | Not connected | LVDS0_D2_P | | | Not connected |
| **S36/71** | Not connected | LVDS0_D2_N | | | Not connected |
| **S37/73** | | GND | | | |
| **S38/75** | Not connected | LVDS0_D1_P | | | Not connected |
| **S39/77** | Not connected | LVDS0_D1_N | | | Not connected |
| **S40/79** | | GND | | | |
| **S41/81** | Not connected | LVDS0_D0_P | | | Not connected |
| **S42/83** | Not connected | LVDS0_D0_N | | | Not connected |
| **S43/85** | | GND | | | |
| **S44/87** | Not connected | LVDS0_CLK_P | | | Not connected |
| **S45/89** | Not connected | LVDS0_CLK_N | | | Not connected |
| **S46/91** | JB pin 050<br>I2C-A_SDA | I2C-A_SDA | I2C1_SDA | No | Signal must be I2C1_SDA since the signal is connected to on-board PMIC.<br>**Note**: This signal has as 2.2Kohm pullup resistor to an internally generated 3.3V supply. |
| **S47/93** | JB pin 048<br>I2C-A_SCL | I2C-A_SCL | I2C1_SCL | No | Signal must be I2C1_SCL since the signal is connected to on-board PMIC.<br>**Note**: This signal has as 2.2Kohm pullup resistor to an internally generated 3.3V supply. |
| **S48/95** | JB pin 054<br>I2C-B_SDA | I2C-B_SDA | I2C2_SDA | Yes | **Note**: This signal has as 2.2Kohm pullup resistor to an internally generated 3.3V supply. |
| **S49/97** | JB pin 052<br>I2C-B_SCL | I2C-B_SCL | I2C2_SCL | Yes | **Note**: This signal has as 2.2Kohm pullup resistor to an internally generated 3.3V supply. |
| **S50/99** | | HDMI/I2C-C_SDA | | | Connected to DSI-to-HDMI bridge (ADV7533) on uCOM Adapter |
| **S51/101** | | HDMI/I2C-C_SCL | | | Connected to DSI-to-HDMI bridge (ADV7533) on uCOM Adapter |
| **S52/103** | JB pin 006<br>GPIO-C | TP_RST | GPIO5 | Yes | |
| **S53/105** | JA pin 100<br>Board specific | TP_IRQ | SAI5_RXD3 | Yes | |
| **S54/107** | JA pin 098<br>Board specific | DISP_PWR_EN | SAI5_RXD2 | Yes | |
| **S55/109** | JA pin 096<br>Board specific | BL_PWR_EN | SAI5_RXD1 | Yes | |
| **S56/111** | JA pin 094<br>Board specific | BL_PWM | SAI5_RXD0 | Yes | |
| **S57/113** | | GND | | | |
| **S58/115** | JA pin 099<br>Board specific | LCD_R0 | SAI3_RXD | Yes | |
| **S59/117** | JA pin 097<br>Board specific | LCD_R1 | SAI3_RXC | Yes | |
| **S60/119** | JA pin 095<br>Board specific | LCD_R2 | SAI3_RXFS | Yes | |
| **S61/121** | JA pin 093<br>Board specific | LCD_R3 | SAI3_TXD | Yes | |

| | | | | |
|---|---|---|---|---|
| **S62/123** | JA pin 089<br>Board specific | LCD_R4 | SAI3_TXC | Yes |
| **S63/125** | JA pin 087<br>Board specific | LCD_R5 | SAI3_TXFS | Yes |
| **S64/127** | JA pin 085<br>Board specific | LCD_R6 | SAI3_MCLK | Yes |
| **S65/129** | JA pin 083<br>Board specific | LCD_R7 | SAI1_RXD7 | Yes |
| **S66/131** | JA pin 079<br>Board specific | LCD_G0 | SAI1_RXD6 | Yes |
| **S67/133** | JA pin 077<br>Board specific | LCD_G1 | SAI1_RXD5 | Yes |
| **S68/135** | JA pin 075<br>Board specific | LCD_G2 | SAI1_RXD4 | Yes |
| **S69/137** | JA pin 073<br>Board specific | LCD_G3 | SAI1_RXD3 | Yes |
| **S70/139** | JA pin 069<br>Board specific | LCD_G4 | SAI1_RXD2 | Yes |
| **S71/141** | JA pin 067<br>Board specific | LCD_G5 | SAI1_RXD1 | Yes |
| **S72/143** | JA pin 065<br>Board specific | LCD_G6 | SAI1_RXD0 | Yes |
| **S73/145** | JA pin 063<br>Board specific | LCD_G7 | SAI1_RXC | Yes |
| **S74/147** | | GND | | |
| **S75/149** | JA pin 059<br>Board specific | LCD_B0 | SAI1_RXFS | Yes |
| **151** | | Non existing pin | | |
| **153** | | Non existing pin | | |
| **155** | | Non existing pin | | |
| **S76/157** | JA pin 057<br>Board specific | LCD_B1 | SAI1_TXD7 | Yes |
| **S77/159** | JA pin 055<br>Board specific | LCD_B2 | SAI1_TXD6 | Yes |
| **S78/161** | JA pin 053<br>Board specific | LCD_B3 | SAI1_TXD5 | Yes |
| **S79/163** | JA pin 049<br>Board specific | LCD_B4 | SAI1_TXD4 | Yes |
| **S80/165** | JA pin 047<br>Board specific | LCD_B5 | SAI1_TXD3 | Yes |
| **S81/167** | JA pin 045<br>Board specific | LCD_B6 | SAI1_TXD2 | Yes |
| **S82/169** | JA pin 043<br>Board specific | LCD_B7 | SAI1_TXD1 | Yes |
| **S83/171** | JA pin 033<br>Board specific | LCD_CLK | SAI1_MCLK | Yes |
| **S84/173** | JB pin 014<br>GPIO-G | GPIO-G | GPIO9 | Yes |
| **S85/175** | JA pin 035<br>Board specific | LCD_HSYNC | SAI1_TXFS | Yes |
| **S86/177** | JA pin 037<br>Board specific | LCD_VSYNC | SAI1_TXC | Yes |

| | | | | | |
|---|---|---|---|---|---|
| **S87/179** | JA pin 039<br>Board specific | LCD_ENABLE | SAI1_TXD0 | Yes | |
| **S88/181** | | GND | | | |
| **S89/183** | Not connected | AIN_VREF | | | Not connected |
| **S90/185** | Not connected | AIN7 | | | Not connected |
| **S91/187** | Not connected | AIN6 | | | Not connected |
| **S92/189** | JA pin 090<br>Board specific | AIN5 | SAI5_RXC | Yes | |
| **S93/191** | JA pin 088<br>Board specific | AIN4 | SAI5_RXFS | Yes | |
| **S94/193** | JA pin 086<br>Board specific | AIN3 | SAI5_MCLK | Yes | |
| **S95/195** | JA pin 084<br>Board specific | AIN2 | SPDIF_EXT_CLK | Yes | |
| **S96/197** | JD pin 019<br>DSI_DN1 | AIN1 | DSI_DN1 | No | |
| **S97/199** | JD pin 021<br>DSI_DP1 | AIN0 | DSI_DP1 | No | |
| **S98/201** | | GND | | | |
| **S99/203** | JD pin 007<br>DSI_DN0 | COM board specific | DSI_DN0 | No | |
| **S100/205** | JD pin 009<br>DSI_DP0 | COM board specific | DSI_DP0 | No | |
| **S101/207** | | GND | | | |
| **S102/209** | JD pin 025<br>DSI_CKN | COM board specific | DSI_CKN | No | |
| **S103/211** | JD pin 027<br>DSI_CKP | COM board specific | DSI_CKP | No | |
| **S104/213** | | GND | | | |
| **S105/215** | Not connected | COM board specific | | | |
| **S106/217** | Not connected | COM board specific | | | |
| **S107/219** | Not connected | COM board specific | | | |
| **S108/221** | Not connected | COM board specific | | | |
| **S109/223** | Not connected | COM board specific | | | |
| **S110/225** | Not connected | COM board specific | | | |
| **S111/227** | JB pin 037<br>SD-A_WP | COM board specific | SD2_WP | Yes | **Note**: the logic level of this signal can be either 3.3V or 1.8V, depending on signal SD2_VSEL. This can change during run time. |
| **S112/229** | JB pin 010<br>GPIO-E | COM board specific | GPIO7 | Yes | |
| **S113/231** | JB pin 008<br>GPIO-D | COM board specific | GPIO6 | Yes | |
| **S114/233** | Not connected | CSI_HSYNC | | | Not connected |
| **S115/235** | Not connected | CSI_VSYNC | | | Not connected |
| **S116/237** | Not connected | CSI_MCLK | | | Not connected |
| **S117/239** | Not connected | CSI_PCLK | | | Not connected |
| **S118/241** | | GND | | | |
| **S119/243** | Not connected | CSI_D0 | | | Not connected |
| **S120/245** | Not connected | CSI_D1 | | | Not connected |

| | | | | | |
|---|---|---|---|---|---|
| **S121/247** | Not connected | CSI_D2 | | | Not connected |
| **S122/249** | Not connected | CSI_D3 | | | Not connected |
| **S123/251** | Not connected | CSI_D4 | | | Not connected |
| **S124/253** | Not connected | CSI_D5 | | | Not connected |
| **S125/255** | Not connected | CSI_D6 | | | Not connected |
| **S126/257** | Not connected | CSI_D7 | | | Not connected |
| **S127/259** | | GND | | | |
| **S128/261** | JD pin 026 CSI_DN3 | CSI_D3_M | CSI_DN3 | No | |
| **S129/263** | JD pin 028 CSI_DP3 | CSI_D3_P | CSI_DP3 | No | |
| **S130/265** | | GND | | | |
| **S131/267** | JD pin 020 CSI_DN2 | CSI_D2_M | CSI_DN2 | No | |
| **S132/269** | JD pin 022 CSI_DP2 | CSI_D2_P | CSI_DP2 | No | |
| **S133/271** | | GND | | | |
| **S134/273** | JD pin 014 CSI_DN1 | CSI_D1_M | CSI_DN1 | No | |
| **S135/275** | JD pin 016 CSI_DP1 | CSI_D1_P | CSI_DP1 | No | |
| **S136/277** | | GND | | | |
| **S137/279** | JD pin 008 CSI_DN0 | CSI_D0_M | CSI_DN0 | No | |
| **S138/281** | JD pin 010 CSI_DP0 | CSI_D0_P | CSI_DP0 | No | |
| **S139/283** | | GND | | | |
| **S140/285** | JD pin 002 CSI_CKN | CSI_CLK_M | CSI_CKN | No | |
| **S141/287** | JD pin 004 CSI_CKP | CSI_CLK_P | CSI_CKP | No | |
| **S142/289** | | GND | | | |
| **S143/291** | Not connected | SATA_TX_P | | | Not connected |
| **S144/293** | Not connected | SATA_TX_N | | | Not connected |
| **S145/295** | | GND | | | |
| **S146/297** | Not connected | SATA_RX_N | | | Not connected |
| **S147/299** | Not connected | SATA_RX_P | | | Not connected |
| **S148/301** | | GND | | | |
| **S149/303** | | GND | | | |
| **S150/305** | JD pin 039 PCIE_CLKP | PCIE_CLK_P | PCIE_CLKP | No | |
| **S151/307** | JD pin 037 PCIE_CLKN | PCIE_CLK_N | PCIE_CLKN | No | |
| **S152/309** | | GND | | | |
| **S153/311** | JD pin 040 PCIE_TXP | PCIE_TX_P | PCIE_TXP | No | |
| **S154/313** | JD pin 038 PCIE_TXN | PCIE_TX_N | PCIE_TXN | No | |

| | | | | |
|---|---|---|---|---|
| **S155/315** | | GND | | |
| **S156/317** | JD pin 034<br>PCIE_RXP | PCIE_RX_P | PCIE_RXP | No |
| **S157/319** | JD pin 032<br>PCIE_RXN | PCIE_RX_N | PCIE_RXN | No |
| **S158/321** | | GND | | |

# 5 Pin Mapping

## 5.1 Functional Multiplexing on I/O Pins

There are a lot of different peripherals inside the i.MX 8M Mini SoC. Many of these peripherals are connected to the IOMUX block, that allows the I/O pins to be configured to carry one of many (up to nine different) alternative functions. This leaves great flexibility to select a function multiplexing scheme for the pins that satisfy the interface need for a particular application.

Some interfaces with specific voltage levels/drivers/transceivers have dedicated pins, like MIPI-DSI, MIPI-CSI and USB. i.MX 8M Mini pins carrying these signals do not have any functional multiplexing possibilities. These interfaces are fixed.

To keep compatibility between EACOM boards the EACOM specified pinning should be followed, but in general there are no restrictions to select alternative pin multiplexing schemes on the *iMX8M Mini uCOM Board*. Note that all EACOM-defined pins are not connected on some EACOM boards, typically because an interface is not supported or there are not enough free pins in the SoC. Further, some EACOM board pins are *type specific*, meaning that these pins might not be compatible with other EACOM boards. Using *type specific* pins may result in lost compatibility between EACOM boards, but not always. Always check details between EACOM boards of interest.

If switching between EACOM boards is not needed, then pin multiplexing can be done without considering the EACOM pin allocation. A custom carrier board design is needed in this case.

Functional multiplexing is normally controlled via the Linux BSP. It can also be done directly via register `IOMUXC_SW_MUX_CTL_PAD_xxx` where `xxx` is the name of the i.MX 8M Mini pin. For more information about the register settings, see the *i.MX 8M Mini Application Processor Reference Manual* from NXP.

Note that input functions that are available on multiple pins will require control of an input multiplexer. This is controlled via register `IOMUXC_xxx_SELECT_INPUT` where `xxx` is the name of the input function. Again, for more information about the register settings see the *i.MX 8M Mini Application Processor Reference Manual* from NXP.

### 5.1.1 Alternative I/O Function List

There is an accompanying Excel document that lists all alternative functions for each available I/O pin. The reset state is shown as well as the EACOM function allocation. The reset state is typically GPIO, ALT5 function, except for the GPIO1_IO01-15 signals that are ALT0 functions, but that is the GPIO function.

## 5.2 I/O Pin Control

Each pin also has an additional control register for configuring input hysteresis, pull up/down resistors, push-pull/open-drain driving, drive strength and more. Also in this case, configuration is normally done via the Linux BSP but it is possible to directly access the control registers, which are called `IOMUXC_SW_PAD_CTL_PAD_xxx` where `xxx` is the name of the i.MX 8M Mini pin. For more information about the register settings, see the *i.MX 8M Mini Application Processor Reference Manual* from NXP.

As a general recommendation, select slow slew rate and lowest drive strength (that still result in acceptable signal edges for the system) in order to reduce problems with EMC.

Note that many pins (but not all) are configured as GPIO inputs, some with pull-down resistor, some without, and some with pull-up resistor, after reset. Some pins are configured as Hi-Z outputs. When the bootloader (typically u-boot) executes it is possible to reconfigure the pins.

**Also note that due to silicon revision errata in the i.MX8M Mini SoC, the pull-up and pull-down resistors are currently not functional when voltage level is 3.3V, which most of the signals are.**

# 6 Interface Description

The **i.MX 8M Mini datasheet and reference manuals from NXP shall always be consulted** for details about different functions and interfaces. Many interfaces are multiplexed on different pins and not available simultaneously. There is an accompanying Excel document that lists all alternative functions for each available I/O pin. It is recommended to study this document to get an overview of the available pin multiplexing options.

The process of defining the pin/function for a system is:

1. Define which interfaces are needed in the system.
2. Allocate each needed interface to either Cortex-A53 ("Linux side") or M4 side ("real-time side").
3. Consult the Excel sheet and allocate the interfaces to different pins.
    a. If possible, follow the EAuCOM pin and interface allocation. It is not strictly needed, but will simplify if the uCOM board will be replaced in a future update/upgrade.
    b. Note that connector JC (and signals allocated to this connector) will not exist if on-board Wi-Fi/BT module is mounted.
    c. Note that not all signals have 3.3V logic level. Some also have 1.8V logic level.
4. When an suitable pin/function allocation has been done, update the *.dts file under Linux to enable the interfaces that shall be controlled from the A53/Linux side. On the M4 side, peripherals are enabled and initialized via function calls, see the SDK for details.
    a. If pin/function allocation is impossible, the basic architecture under 1) must be reexamined and updated.

This remaining of the chapter is only relevant if you have an iMX8M Mini uCOM Developer's Kit V2. **Skip the rest of this chapter if you have an iMX8M Mini uCOM Developer's Kit V3.**

## 6.1 Display Interface

The i.MX 8M Mini SoC only has a MIPI-DSI display output. If a display is needed and the display has a MIPI-DSI interface, then the two interfaces can be connected directly. Alternatively, a MIPI-DSI to HDMI or MIPI-DSI to LVDS bridge is used to connect to a display with HDMI or LVDS interface.

The MIPI-DSI interface with two data lanes is allocated to connector JD, see the fourth table in section 3.2 .

The *uCOM Adapter Board* has a MIPI-DSI to HDMI bridge that is connected to the MIPI-DSI interface of the i.MX8M Mini SoC by default. The HDMI connector on the *COM Carrier Board* will carry the HDMI display output.

See section 12.3 for a special note about COM Carrier Board versions and how the HDMI DDC I2C channel is connected.

## 6.2 JTAG

This section lists signals related to the JTAG debug interface.

The i.MX 8M Mini SoC has a module called System JTAG Controller (SJC) that provides a JTAG interface to internal logic, including the ARM Cortex-A53 cores and Cortex-M4 cores. The SJC complies with JTAG TAP standards. The i.MX 8M Mini SoC uses the JTAG port for production, testing, and system debugging.

The i.MX 8M Mini JTAG interface is located on the following pins on connector JB.

| JB Pin Number | EAuCOM Board Signal | i.MX 8M Mini Ball Name | Alternative Pin Function? | Notes |
|---|---|---|---|---|
| **JB pin 70** | POR_B | POR_B | | Connected to RESET0_B on the i.MX 8M Mini SoC. Signal shall normally only be used to connect to debug interface connector.<br>Signal has a 10K ohm pull-up resistor. |
| **JB pin 82** | JTAG_VCC | PMIC: BUCK7 (NVCC_1V8) | | The supply voltage of the JTAG debug interface. Is connected to the supply voltage of PTA (default is 3.3V). |
| **JB pin 86** | JTAG_TCK | JTAG_TCK | No | Signal has a 10K ohm pull-down resistor. |
| **JB pin 88** | JTAG_TMS | JTAG_TMS | No | |
| **JB pin 90** | JTAG_TDI | JTAG_TDI | No | |
| **JB pin 92** | JTAG_TDO | JTAG_TDO | No | |
| **JB pin 94** | JTAG_TRST | JTAG_TRST | No | |
| **JB pin 96** | JTAG_MOD | JTAG_MOD | No | |

The JTAG signals are not available on the MXM3 edge connector. Instead, the signals are available via a 10 pos FPC connector, see picture below for location and orientation.

When using the the *uCOM Adapter Board*, there is a 10 pos FPC connector that is used on all EACOM boards for JTAG access, see picture below for location and orientation.

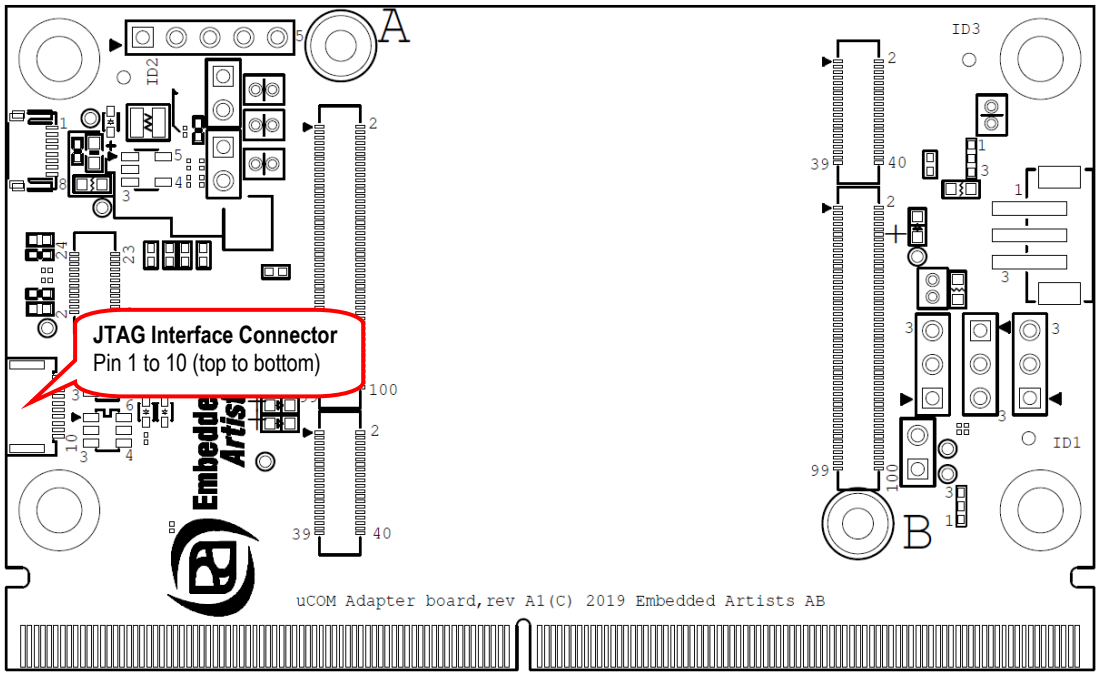


Figure 5 – uCOM Adapter Board, Location of JTAG Interface Connector

The table below lists the 10 signals on the JTAG connector.

| JTAG connector Pin Number | Connected to i.MX 8M Mini Ball Name | I/O | Description | Remarks |
|---|---|---|---|---|
| **1** | PMIC: BUCK7 (NVCC_1V8) | | NVCC_JTAG<br>Logic level supply voltage | Used by external debugger to detect logic level to use for signaling. |
| **2** | JTAG_TMS | I | JTAG signal TMS | |
| **3** | | | Ground | |
| **4** | JTAG_TCK | I | JTAG signal TCK | Signal has a 10K ohm pull-down resistor. |

| | | | | |
|---|---|---|---|---|
| **5** | | | Ground | |
| **6** | JTAG_TDO | O | JTAG signal TDO | |
| **7** | JTAG_MOD | I | JTAG_MOD | |
| **8** | JTAG_TDI | I | JTAG signal TDI | |
| **9** | JTAG_TRST | I | JTAG signal TRST | |
| **10** | POR_B | I | System reset | Signal is active low and controls internal system reset. Signal has a 10K ohm pull-up resistor. |

There is on-board ESD protection of the JTAG interface, but it is still important to observe ESD precaution when connecting to this interface. There is no need for external pull-up or pull-down resistors.

The *iMX8M Mini Developer's Kit* contains an adapter board for connection to common debug connectors. The 10 pos connector is Molex 512811094 and has 0.5 mm (20 mil) pitch. FPC length should be kept less than 7 cm.

# 7 Boot Control

This chapter presents the different boot settings that the *iMX8M Mini uCOM Board* supports.

During development the default boot is controlled by slider switches (if an iMX8M Mini uCOM Developer's Kit **V2**, see section 7.2 for details) or pull-up resistors on the uCOM Carrier Board (if an iMX8M Mini uCOM Developer's Kit **V3**). In an end-product environment, it is common to control the boot process by programming the OTP fuses.

The *iMX8M Mini uCOM Board* supports booting (i.e., from where the i.MX 8M Mini SoC starts downloading code to start executing from) from different sources:

1. On-board eMMC flash, which is the default (if this is programmed via the slider switches on the *uCOM Adapter Board*).
2. USB OTG download (also called 'serial download') that only boots the A7 core.
3. Other sources, like external SD/MMC memory cards, etc. This can be controlled by either slider switches on the *uCOM Adapter Board* or programmed via OTP fuses.

Two signals control the booting source/process, BOOT_CTRL and ISP_ENABLE, see table below:

| Boot source | BOOT_CTRL | ISP_ENABLE |
|---|---|---|
| **Boot from on-board eMMC**<br>The board boots according to the default settings of signals SAI1_RXD0-SAI1_RXD7 and SAI1_TXD0-SAI1_TXD7, which have been setup to boot from eMMC. This default setting is controlled by slider switches (if an iMX8M Mini uCOM Developer's Kit **V2**, see section 7.2 for details) or pull-up resistors on the uCOM Carrier Board (if an iMX8M Mini uCOM Developer's Kit **V3**).<br>Note that these signals may not be driven externally just after reset by anything other than the slider switches/pull-up resistors because the setting is sampled by the i.MX processor just after reset.<br>This is the default operation for the iMX8M Mini Developer's Kit V2/V3.<br>**If any of the boot control/configuration signals are driven externally during/just after reset, the on-chip OTP fuses must be programmed to control the boot operation.** | LOW (grounded)<br>Jumper inserted / shorted on carrier board | Floating<br>Jumper open on carrier board |
| **Boot according to OTP fuses (eFuses)**<br>• Any boot mode supported by the i.MX 8M Mini SoC and the hardware connected to it can be selected. See *i.MX8M Mini Applications Processor Reference Manual* for details about available sources and OTP fuse settings.<br>• Note that OTP fuse BT_FUSE_SEL must be set to 1 in order to have OTP fuse settings controlling boot source. If not set to 1, the USB OTG boot mode (aka "Serial download") is activated.<br>• Programming OTP fuses is a critical operation. If wrong fuses are programmed boards will likely become unusable and there is no recovery.<br>• *iMX8M Mini uCOM Boards* are delivered without programmed on-chip OTP fuses. Users have full control over these. | Floating<br>Jumper open on carrier board | Floating<br>Jumper open on carrier board |

| | | |
|---|---|---|
| **USB OTG**<br>This is known as "Serial Download" or "Recovery" mode.<br>This mode is used during development and in production to download the first stage bootloader. It is typically not used by the end-product during normal operation.<br>This mode is activated by pulling signal ISP_ENABLE low regardless of signal BOOT_CTRL. | Do not care | LOW (grounded)<br>Jumper inserted / shorted on carrier board |

**To summarize:**

1. **The *iMX8M Mini uCOM board* must be setup to boot from eMMC mode as default (by slider switches on the *uCOM Adapter Board or pull-up resistors in case of a V3 kit*). If another source is needed, program the OTP fuses.**
   Leave signal ISP_ENABLE floating and BOOT_CTRL grounded for this mode.
2. **If using the default setup (boot from eMMC), make sure the boot control pins (SAI1_RXD0-SAI1_RXD7 and SAI1_TXD0-SAI1_TXD7) are not driven externally during/just after reset.**
3. If signal ISP_ENABLE is pulled low (grounded), the i.MX 8M Mini SoC boots into USB OTG mode. This mode it typically used during development and also during production (when the program images shall be downloaded the first time). **It is recommended to add a feature on the custom carrier board so that pin ISP_ENABLE can be optionally grounded.**
4. To boot from OTP fuses, leave signal BOOT_CTRL floating and program OTP fuses.

On a custom carrier board, it is recommended to connect signal BOOT_CTRL to the ground via a zero-ohm resistor. Never directly to ground. This would make it easy to leave the pin floating, if ever needed. Also do not forget to control the boot mode with pull-up resistors.

Read section 0- 7.2 (and skip section 7.3 ) if you have an iMX8M Mini uCOM Developer's Kit **V2**.

Read section 7.3 (and skip section 0- 7.2 ) if you have an iMX8M Mini uCOM Developer's Kit **V3**.

## 7.1 COM Carrier Board Boot Control Jumpers – Developer's Kit V2

This section describes where to find the two boot control jumpers on the COM Carrier Board. Note that J27 only exist on COM Carrier Board rev E, or later.

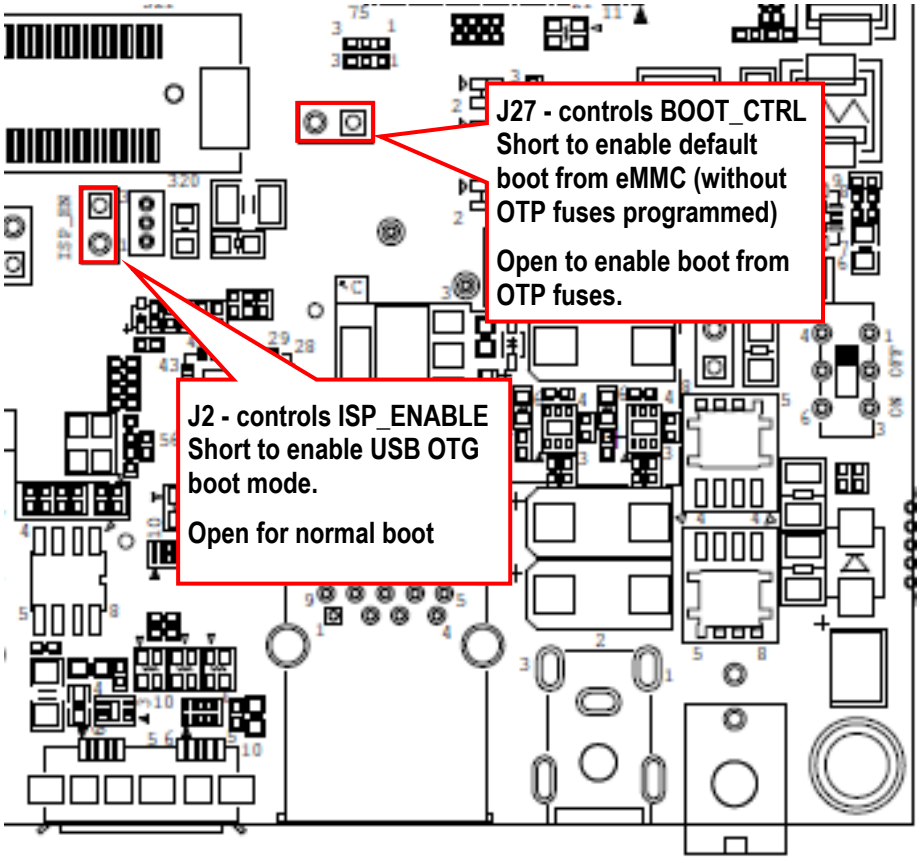


Figure 6 – COM Carrier Board rev E/E1, Boot Control Jumpers

## 7.2 uCOM Adapter Board Boot Sliders

This section describes how to set the slider switches on the uCOM Adapter Board bottom side for correct boot control.

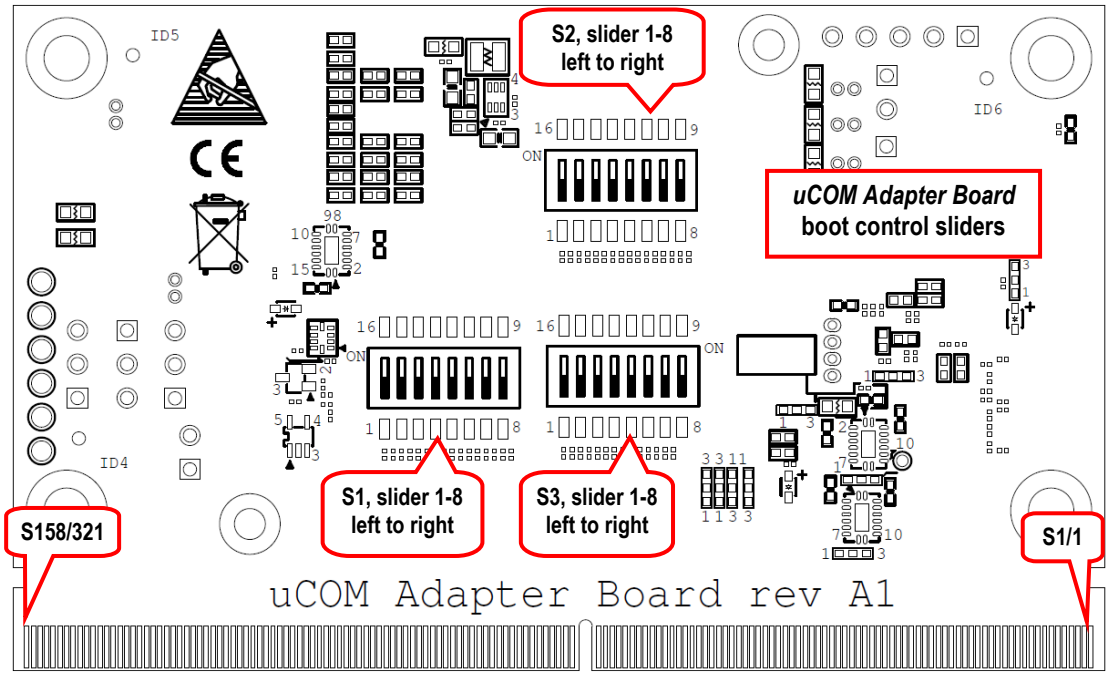


Figure 7 – uCOM Adapter Board Slider Numbering, Bottom Side

| Slider Switch | Boot config pin | Default | Description (ON = upper position in Figure 7, OFF = lower position) |
|---|---|---|---|
| S1:1 | BOOT_CFG[8] (SAI1_TXD0) | OFF | OFF |
| S1:2 | BOOT_CFG[9] (SAI1_TXD1) | OFF | OFF |
| S1:3 | BOOT_CFG[10] (SAI1_TXD2) | OFF | OFF = uSDHC3 |
| S1:4 | BOOT_CFG[11] (SAI1_TXD3) | ON | ON |
| S1:5 | BOOT_CFG[12] (SAI1_TXD4) | OFF | OFF = eMMC |
| S1:6 | BOOT_CFG[13] (SAI1_TXD5) | ON | ON |
| S1:7 | BOOT_CFG[14] (SAI1_TXD6) | OFF | OFF |
| S1:8 | BOOT_CFG[15] (SAI1_TXD7) | OFF | OFF |
| S2: 1 | BOOT_CFG[0] (SAI1_RXD0) | OFF | OFF |
| S2:2 | BOOT_CFG[1] (SAI1_RXD1) | ON | ON = 1.8V logic level |
| S2:3 | BOOT_CFG[2] (SAI1_RXD2) | ON | ON = High speed |
| S2:4 | BOOT_CFG[3] (SAI1_RXD3) | OFF | OFF |
| S2:5 | BOOT_CFG[4] (SAI1_RXD4) | OFF | OFF = 8 bit DDR mode |
| S2:6 | BOOT_CFG[5] (SAI1_RXD5) | ON | ON |
| S2:7 | BOOT_CFG[6] (SAI1_RXD6) | ON | ON |
| S2:8 | BOOT_CFG[7] (SAI1_RXD7) | OFF | OFF = regular boot |
| S3:1 | | | Not used |
| S3:2 | | | Not used |

| | | | |
|---|---|---|---|
| S3:3 | | | Not used |
| S3:4 | | | Not used |
| S3:5 | | | Not used |
| S3:6 | | | Not used |
| S3:7 | | | OFF |
| S3:8 | USB_SELECT | OFF | OFF: USB-A on uCOM connected to USB-1 (OTG). This is the only setting that is valid.<br>ON: Do not set the slider in this position. That will make both USB channels inoperable. |

## 7.3 uCOM Carrier Board Boot Control Jumpers – Developer's Kit V3

This section describes where to find the two boot control jumpers on the uCOM Carrier Board.

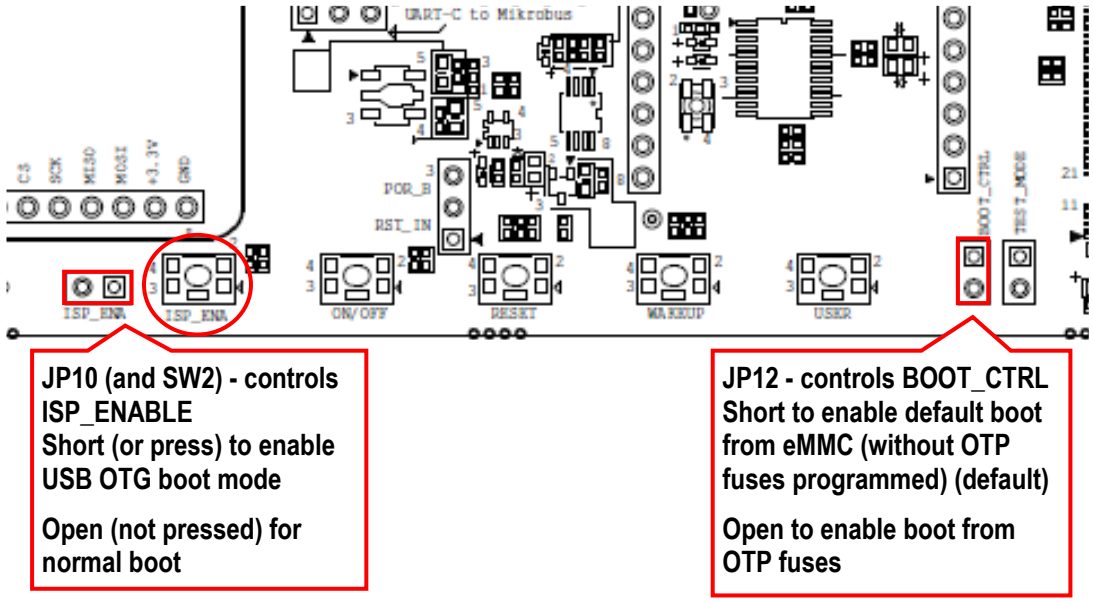


Figure 8 – uCOM Carrier Board, Boot Control Jumpers

If the configuration pins shall control the boot, the following signals must be pulled high (for example via 10K ohm pull-up resistors) during and just after reset to boot from eMMC:

- SAI1_TXD3 (BT_CFG11-1), pin JA pin 47 (GPIO_LCDIF_D2)
- SAI1_TXD5 (BT_CFG13-1), pin JA pin 53 (GPIO_LCDIF_D4)
- SAI1_RXD1 (BT_CFG1-1), pin JA pin 67 (GPIO_LCDIF_D10)
- SAI1_RXD2 (BT_CFG2-1), pin JA pin 69 (GPIO_LCDIF_D11)
- SAI1_RXD5 (BT_CFG5-1), pin JA pin 77 (GPIO_LCDIF_D14)
- SAI1_RXD6 (BT_CFG6-1), pin JA pin 79 (GPIO_LCDIF_D15)

Also note that the following pins must be low. There are on-chip pull-down resistors for this, so pull-down resistors are normally not needed, but the pins are listed for completeness:

- SAI1_RXD0 (BT_CFG0-0), JA pin 65 (GPIO_LCDIF_D9)
- SAI1_RXD3 (BT_CFG3-0), JA pin 73 (GPIO_LCDIF_D12)

- SAI1_RXD4 (BT_CFG4-0), JA pin 75 (GPIO_LCDIF_D13)
- SAI1_RXD7 (BT_CFG7-0), JA pin 83 (GPIO_LCDIF_D16)
- SAI1_TXD0 (BT_CFG8-0), JA pin 39 (GPIO_LCDIF_ENABLE)
- SAI1_TXD1 (BT_CFG9-0), JA pin 43 (GPIO_LCDIF_D0)
- SAI1_TXD2 (BT_CFG10-0), JA pin 45 (GPIO_LCDIF_D1)
- SAI1_TXD4 (BT_CFG12-0), JA pin 49 (GPIO_LCDIF_D3)
- SAI1_TXD6 (BT_CFG14-0), JA pin 55 (GPIO_LCDIF_D5)
- SAI1_TXD7 (BT_CFG15-0), JA pin 57 (GPIO_LCDIF_D6)

# 8 Powering and PMIC Integration

The i.MX 8M Mini SoC is tightly integrated with the PMIC (BD71847MWV) in order to achieve high-performance and low-power operation of the *iMX8M Mini uCOM Board*. The BD71847MWV PMIC is specifically developed for the i.MX 8M Mini SoC. It also includes a real-time clock. See the BD71847MWV datasheet for details about each function.

The PMIC has multiple linear and DC/DC voltage regulators. Some are available for the carrier board design, reducing integration cost. Designs with moderate power consumptions may not need any external power supply at all. Everything can be handled by the on-board PMIC. Section 8.1 presents the available power rails.

## 8.1 Available Power Supply Rails

The table below presents the available power rails that can be used on the carrier board that the *iMX8M Mini uCOM Board* is integrated on.

| Power Rail Output | Description | Voltage Range | Max Current |
|---|---|---|---|
| **NVCC_3V3**<br>**on JA pins 20/22/24/26/28/30** | 3.3V for external use. | 3.3V | 750mA |
| **NVCC_1V8**<br>**on JA pins 19/21/23/25/27/29** | 1.8V for external use. | 1.8V | 500mA |

Note that each pin on the Hirose DF40C expansion connectors can carry 300mA maximum. Connect to all pins on the expansion connectors that carry a specific power rail. High current power rails have more than one pin.

Note that external load variations can affect the PMIC operation and potentially disturb the i.MX 8M Mini SoC operation. Make sure that the carrier board electronics does not have abrupt consumption variations and does not generate noise on the power rails. Also **calculate the heat dissipation** of the PMIC in case the carrier board has high current consumption.

## 8.2 Integration

This integration is very simple. An external 3.5-5.2V supply is basically all that is needed.

- Supply the 3.5-5.2V input voltage to **VSYS_4V2** (connect to all eight pins on connector JA)
- Optionally supply a 3.5-5.2V input voltage to **VBAT_RTC_IN** to power the real-time clock (RTC) and keep it running. If no supply is connected to VBAT_RTC_IN, the RTC is powered from VSYS_4V2 supply input as long as this is valid.
- Leave signals BAT_TEMP, BAT_CURRP and BAT_CURRN unconnected.
- Leave supply inputs PSU_5V on JA pin 54/56/58/60 and VBUS_USB on JA pin 62/64/66/68 unconnected.

# 9 Murata 1ZM Wi-Fi/BT Module Mounting Option

There is a mounting option for the iMX8M Mini uCOM board where a very power-efficient Wi-Fi/BT module, 1ZM from Murata is mounted. The picture below illustrates where the 1ZM module is mounted in the board (but the picture shows the 1MW mounted – there are multiple module options). The u.fl. antenna connector is located in the lower left corner.

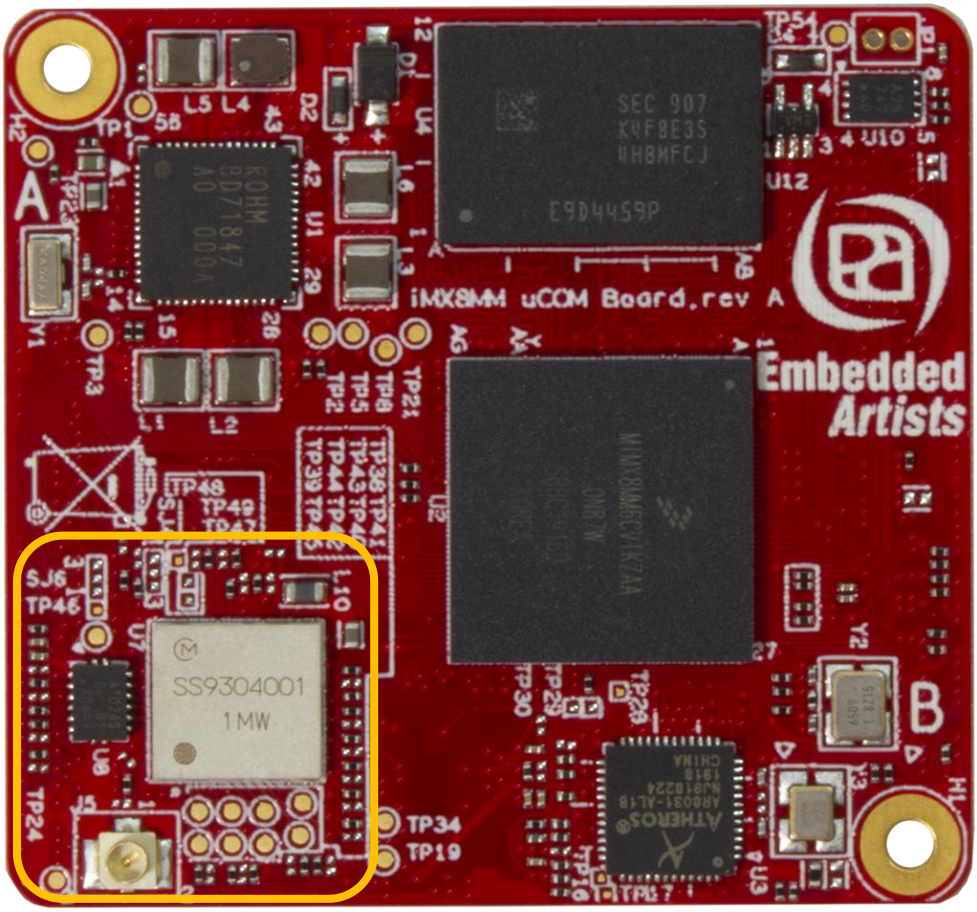


Figure 9 – 1ZM Wi-Fi/BT Module Mounted on iMX8M Mini uCOM Board

**With this mounting option, JC is not mounted. The signals available on this connector are all used to connect to the Wi-Fi/BT module. A UART channel is also dedicated to the Bluetooth interface, so the following pins are also not available:**

- **JB pin 1 (UART-C_RXD/ UART1_RXD)**
- **JB pin 3 (UART-C_TXD/ UART1_TXD)**
- **JB pin 9 (UART-CB_CTS/ UART3_RXD)**
- **JB pin 11 (UART-C_RTS/ UART3_TXD)**

The Wi/Fi module is powered by default from the on-board generated 3.3V (from PMIC BUCK6). There is a mounting option that allows for the Wi-Fi/BT module to be powered from an external 3.3-3.6V supply. Contact Embedded Artists for further information.

Note that this version is not a stocked mounting option. A minimum order quantity (MOQ) will apply. Contact Embedded Artists for further information.

# 10 Technical Specification

## 10.1 Absolute Maximum Ratings

All voltages are with respect to ground, unless otherwise noted. Stress above these limits may cause malfunction or permanent damage to the board.

| Symbol | Description | Min | Max | Unit |
|---|---|---|---|---|
| **VSYS_4V2** | Main input supply voltage | -0.3 | 5.5 | V |
| **VBAT_RTC_IN** | RTC supply voltage | -0.3 | 5.5 | V |
| **VIO** | Vin/Vout (I/O VDD + 0.3): 3.3V IO | 0 | 3.6 | V |
| | Vin/Vout (I/O VDD + 0.3): 1.8V IO | 0 | 1.98 | V |
| **USB_xx_VBUS** | USB VBUS signals | -0.3 | 5.25 | V |
| **USB_xx_DP/DN** | USB data signal pairs | -0.3 | 3.63 | V |

## 10.2 Recommended Operating Conditions

All voltages are with respect to ground, unless otherwise noted.

| Symbol | Description | Min | Typical | Max | Unit |
|---|---|---|---|---|---|
| **VSYS_4V2** | Main input supply voltage | 3.5 | | 5.2 | V |
| | Ripple with frequency content < 10 MHz | | | 50 | mV |
| | Ripple with frequency content ≥ 10 MHz | | | 10 | mV |
| **VBAT_RTC_IN** | RTC supply voltage | 3.5 | | 5.0 | V |
| | **Note:** This voltage must remain valid at all times for correct operation of the board (including, but not limited to the RTC). | | | | |
| **USB_xx_VBUS** | USB VBUS signals | | 5 | 5.25 | V |

## 10.3 Power Ramp-Up Time Requirements

Input supply voltages (VIN and VBAT) shall have smooth and continuous ramp from 10% to 90% of final set-point. Input supply voltages shall reach recommended operating range in 1-20 ms.

## 10.4 Electrical Characteristics

For DC electrical characteristics of specific pins, see i.MX 8M Mini Datasheet. The internal VDD operating point for GPIOs is 3.3V or 1.8V for all signals.

### 10.4.1 Reset Output Voltage Range

The reset output is an open drain output with a 1500 ohm pull-up resistor to VIN. Maximum output voltage when active is 0.4V.

### 10.4.2 Reset Input

The reset input is triggered by pulling the reset input low (0.2 V max) for 10 uS minimum. The internal reset pulse will be 140-560 mS long, before the i.MX 8M Mini boot process starts.

## 10.5 Power Consumption

There are several factors that determine power consumption of the *iMX8M Mini uCOM Board*, like input voltage, operating temperature, LPDDR4 activity, operating frequencies for the different cores, DVFS levels and software executed (i.e., Linux distribution).

The values presented are typical values and should be regarded as an estimate. Always measure current consumption in the real system to get a more accurate estimate.

| Symbol | Description (VIN = 4.2V, Toperating = 25°C) | Typical | Max Observed | Unit |
|---|---|---|---|---|
| $I_{VIN}$_MAX | Maximum CPU load, 1.8 GHz ARM frequency, without Ethernet | | TBD | mA |
| $I_{VIN}$_IDLE | System idle state, uBoot prompt<br>Linux prompt | | TBD<br>TBD | mA |
| $I_{VIN}$_DSM | Deep-Sleep mode (DSM), aka "Dormant mode" or "Suspend-to-RAM" in Linux BSP | TBD | | mA |
| $I_{VIN}$_STB | Linux standby | TBD | | mA |
| $I_{VBAT}$_BACKUP | Current consumption to keep internal RTC running | TBD | | uA |

## 10.6 Mechanical Dimensions

The table below presents the mechanical dimensions of the module.

| Dimension | Value (±0.1 mm) | Unit |
|---|---|---|
| Module width | 42 | mm |
| Module height | 45 | mm |
| Module top side height | 2.0 | mm |
| Module bottom side height | 1.4 | mm |
| PCB thickness | 1.4 | mm |
| Mounting hole diameter | 2.3 | mm |
| Module weight | 2 ±0.5 gram | gram |

The picture below illustrates the mechanical details of the *iMX8M Mini uCOM Board*. The outer measurement is 42 x 45 mm. Note that the picture is seen from the bottom side.

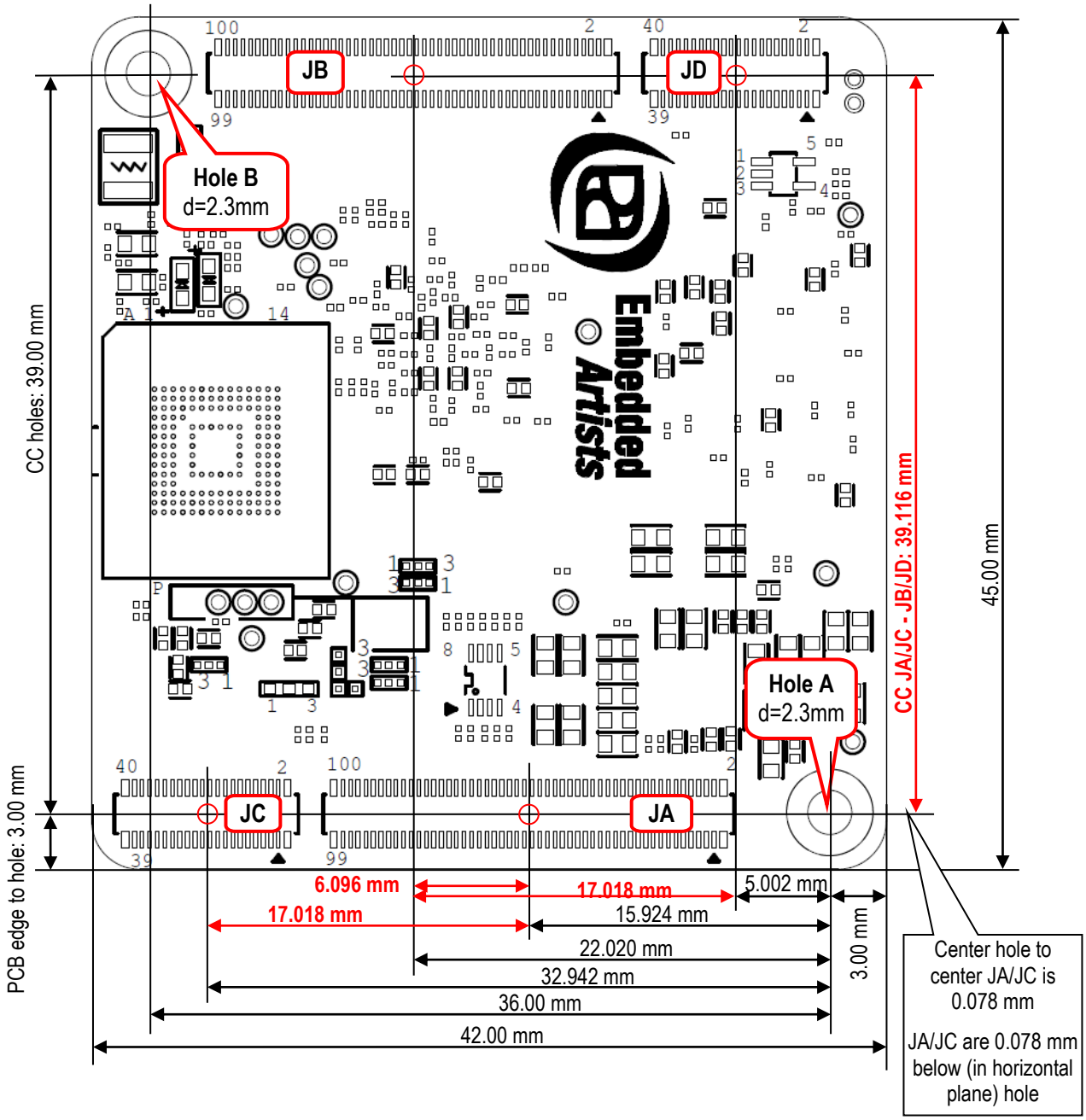


Figure 10 – iMX8M Mini uCOM Board Mechanical Outline, View from Bottom Side

**Note** that placement of the connectors on the carrier board is very important. They must be parallel and have a placement tolerance of +-0.1mm (non-accumulative). Make sure the relative measures between the connectors (marked with red in the picture above) are correct.

**Note** that the mounting hole location shall be measured relative to the three connectors, not relative to the pcb edge.

Since the stacking height is only 1.5mm in normal case, make sure no components other than the three connectors are within the dotted red line. When using 3mm stacking height it is possible to have low-profile components under the *iMX8M Mini uCOM Board*. The picture below illustrates the principal dimensions.

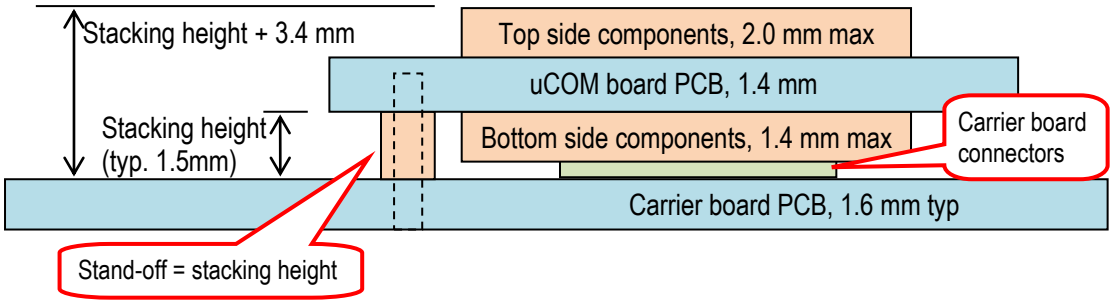


Figure 11 – uCOM Board Mounting on Carrier Board, Stacking Height

### 10.6.1 DF40C Socket

The headers mounted on the *iMX8M Mini uCOM Board* are DF40C-100DP-0.4V(51) (for JA / JB) and DF40C-40DP-0.4V(51) (for JC / JD).

The receptacles that are needed on the carrier board are, depending on stacking height:

| Connector | 1.5 mm stacking height (standard) | 3.0 mm stacking height |
|---|---|---|
| **100-pos (JA / JB)** | DF40C-100DS-0.4V(51)<br>HRS number: 684-4033-4 51 | DF40HC(3.0)-100DS-0.4V(51)<br>HRS number: 684-4151-0 51 |
| **40-pos (JC / JD)** | DF40C-40DS-0.4V(51)<br>HRS number: 684-4008-7 51 | DF40HC(3.0)-40DS-0.4V(51)<br>HRS number: 684-4169-6 51 |

If any of the connectors are not needed on the carrier board design, these do not have to be mounted. This typically applies to JC and JD.

### 10.6.2 Module Assembly Hardware

The *iMX8M Mini uCOM Board* has two 2.3mm mounting holes for securing a good mechanical mounting. Use M2 screws and associated standoffs that have the same height as the stacking height (1.5mm or 3 mm, depending on carrier board connectors).

When mounting the iMX8M Mini uCOM board, match hole A on the carrier board with hole A on the uCOM board before the final mounting.

## 10.7 Environmental Specification

### 10.7.1 Operating Temperature

Ambient temperature ($T_A$)

| Parameter | | Min | Max | Unit |
|---|---|---|---|---|
| Operating temperature range: | commercial temperature range<br>industrial temperature range | 0<br>-40 | 70[1]<br>85[1] | °C<br>°C |
| Storage temperature range | | -40 | 85 | °C |
| Junction temperature i.MX 8M Mini SoC, operating: | comm. temp. range<br>ind. temp. range. | 0<br>-40 | 95<br>105 | °C<br>°C |

[1] Depends on cooling/heat management solution.

### 10.7.2 Relative Humidity (RH)

| Parameter | Min | Max | Unit |
|---|---|---|---|
| Operating: 0°C ≤ $T_A$ ≤ 70°C, non-condensing (comm. temp. range)<br>Operating: -40°C ≤ $T_A$ ≤ 85°C, non-condensing (ind. temp. range) | 10 | 90 | % |
| Non-operating/Storage: -40°C ≤ $T_A$ ≤ 85°C, non-condensing | 5 | 90 | % |

## 10.8 Thermal Design Considerations

Heat dissipation from the i.MX 8M Mini SoC depends on many operating conditions, like operating frequency, operating voltage, activity type, activity cycle duration and duty cycle. Dissipated heat can be up to 3 Watt but is typically much lower.

Whether external cooling is needed, or not, depends on dissipated heat and ambient temperature range. In most cases it is possible to operate the *iMX8M Mini uCOM Board* without external cooling, at least with ambient temperature up to +50° Celsius. Above this, care must be taken not to exceed max junction temperature of the i.MX 8M Mini SoC.

The i.MX 8M Mini SoC implements DVFS (Dynamic Voltage and Frequency Scaling) and Thermal Throttling via the Linux BSP. This enables the system to continuously adjust operating frequency and voltage in response to changes in workload and temperature. In general, this results in higher performance at lower average power consumption.

The i.MX 8M Mini SoC has an integrated temperature sensor for monitoring the junction (i.e., die) temperature, which affects several factors:

- A lower junction temperature, Tj, will result in longer SoC lifetime. See the following document for details: i.MX 8M Mini Dual Product Lifetime Usage.
- A lower die temperature will result in lower power consumption due to lower leakage current.

### 10.8.1 Thermal Parameters

The i.MX 8M Mini SoC thermal parameters are listed in the table below.

| Parameter | Typical | Unit |
|---|---|---|
| **Thermal Resistance, CPU Junction to ambient ($R_{\theta JA}$), natural convection** | 22.9 | °C/W |
| **Thermal Resistance, CPU Junction to package top ($R_{\theta JC}$)** | 4 | °C/W |

## 10.9 Product Compliance

Visit Embedded Artists' website at http://www.embeddedartists.com/product_compliance for up to date information about product compliances such as CE, RoHS2/3, Conflict Minerals, REACH, etc.

# 11 Functional Verification and RMA

There is a separate document that presents several functional tests that can be performed on the *iMX8M Mini uCOM Board* to verify correct operation on the different interfaces. Note that these tests must be performed on the carrier board that is supplied with the *iMX8M Mini uCOM Developer's Kit* and with a precompiled kernel from Embedded Artists.

The tests can also be done to troubleshoot a board that does not seem to operate properly. It is strongly advised to read through the list of tests and actions that can be done before contacting Embedded Artists. The different tests can help determine if there is a problem with the board, or not. For return policy, please read Embedded Artists' General Terms and Conditions document (http://www.embeddedartists.com/sites/default/files/docs/General_Terms_and_Conditions.pdf).

# 12 Things to Note

This chapter presents a number of issues and considerations that users must note.

## 12.1 Shared Pins and Multiplexing

The i.MX 8M Mini SoC has multiple on-chip interfaces that are multiplexed on the external pins. It is not possible to use all interfaces simultaneously and some interface usage is prohibited by the *iMX8M Mini uCOM* on-board design. Check if the needed interfaces are available to allocation before starting a design. See chapter 5 for details.

## 12.2 Use COM Carrier Board, rev E/E1 or Later

When using the *iMX8M Mini uCOM board*, only use *COM Carrier Board* rev E/E1, or later. Earlier *COM Carrier Board* versions do not support the 4.2V input supply voltage that is needed for the iMX8M Mini uCOM board.

Note that *iMX Developer's Kits* that use the *COM Carrier Board* rev E/E1, or later, are called "*iMX Developer's Kits V2*".

Also note that there is a newer iMX8M Mini Developer's Kit V3 that is sold from 2021.

## 12.3 COM Carrier Board Revision and HDMI Interface

This section is only relevant if you have an iMX8M Mini uCOM Developer's Kit V2. **Skip it if you have an iMX8M Mini uCOM Developer's Kit V3.**

Two versions of the COM Carrier board have been released, rev E and rev E1. Of these, only the latest revision (rev E1 and later) will allow the HDMI DDC interface to work correctly, see table below:

| **Board revisions** | **COM Carrier Board, rev E**<br>HDMI DDC interface connected to I2C-B | **COM Carrier Board, rev E1**<br>HDMI DDC interface connected to I2C-C |
|---|---|---|
| **iMX8M Mini uCOM board, rev A**<br>plus<br>**uCOM Adapter Board, rev A/A1**<br>HDMI DDC interface connected to I2C-C by default | On *uCOM Adapter Board*, move zero ohm resistors (0402 size) on SJ4, SJ5, SJ7 and SJ8 to 2-3 position (from 1-2 position).<br>The HDMI DDC interface will be using I2C-B interface after the rework.<br>Note that after the rework, the M.2 I2C connection will no longer work (PCA expander). | Will work out-of-the-box. |

## 12.4 Handle the uCOM Board with Great Care

Handle the *iMX8M Mini uCOM board* with great mechanical care. Only remove/unmount it from the *uCOM Carrier board* if absolutely needed. Only use small movements and small force. Do not insert a screwdriver between the uCOM board and uCOM Carrier board and bend without having first watched the Youtube video we have published about this topic:
https://www.youtube.com/watch?v=-a1UGi_rrLM, title "How to mount and unmount a uCOM board"

## 12.5 Note uCOM Orientation When Mounting

It is possible to mount the uCOM board with incorrect orientation. Doing that will damage the uCOM board beyond repair and can also damage the carrier board. Make sure (production) mounting instructions are particular about the orientation and how to identify the correct orientation of the uCOM. It is recommended to add notes on the silk screen on the carrier board to make operators aware of the issue. The picture below illustrates the silk screen text found on the *uCOM Carrier Board*.

**Always match the "A" and "B" marking on the uCOM with the "A" and "B" on the *Carrier Board*.**

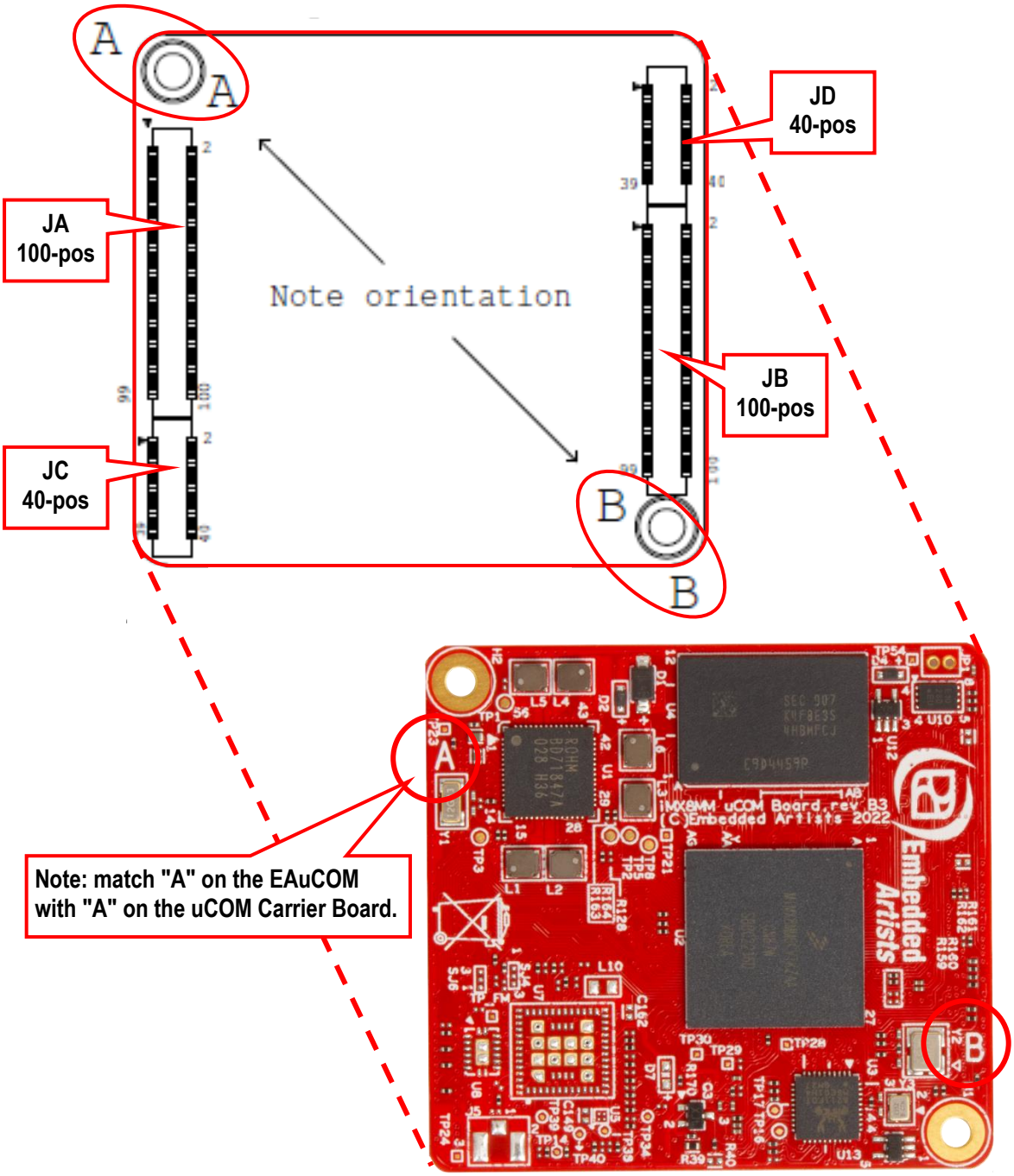


Figure 12 – Orientation of uCOM Board when Mounting on Carrier Board

## 12.6 uCOM Adapter Board rev A/A1 and Different uCOM Modules

This section is only relevant if you have an iMX8M Mini uCOM Developer's Kit V2. **Skip it if you have an iMX8M Mini uCOM Developer's Kit V3.**

The *uCOM Adapter Board* is designed for different uCOM modules that can have different voltage levels on signals with common pinning. One such example is UART-B, which has 1.8V logic level on the *iMX7ULP uCOM* and 3.3V on the *iMX8M Mini/Nano uCOM*.

**On rev A of the uCOM Adapter board**, SJ10 controls the logic level on UART-B signals and need to be differently set for the two uCOM modules. The picture below illustrates where SJ10 can be found and the two settings available.

Note that SJ10 will be correctly set when buying an *iMX 8M Mini/Nano uCOM Developer's Kit* or an *iMX7ULP uCOM Developer's Kit* but when switching uCOM modules on a *uCOM Adapter Board* SJ10 must be checked and adjusted, if needed.

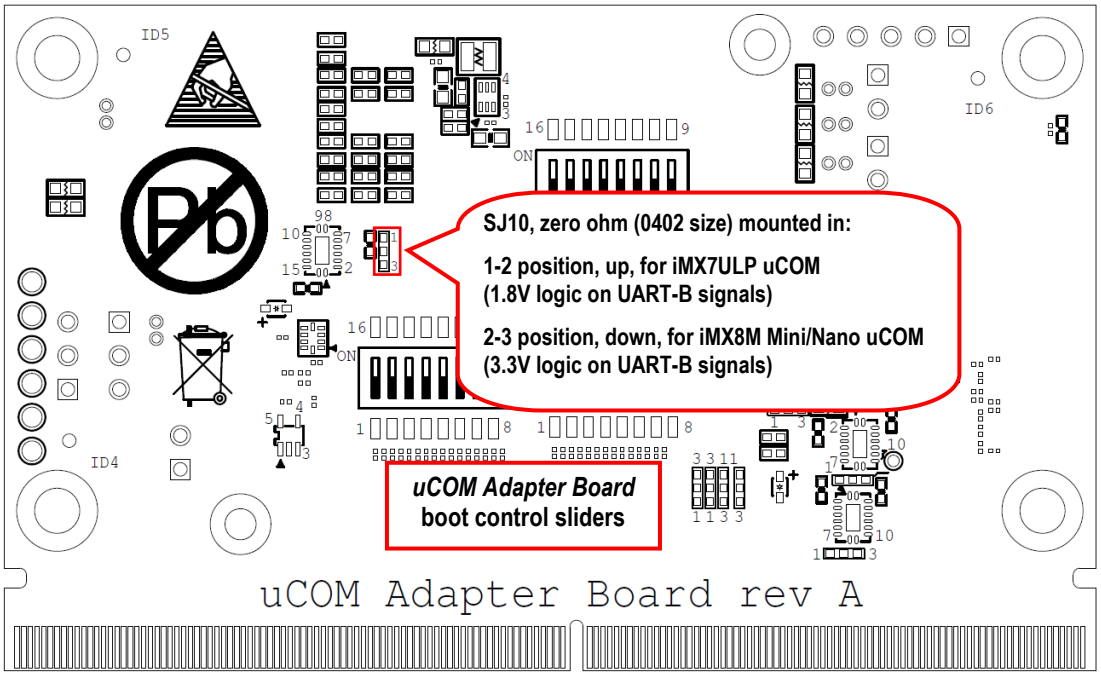


Figure 13 – uCOM Adapter Board rev A, SJ10 Location, Bottom Side

**On rev A1 of the uCOM Adapter board**, J13 controls the logic level on UART-B signals and need to be differently set for the two uCOM modules. The picture below illustrates where J13 can be found and the two settings available.

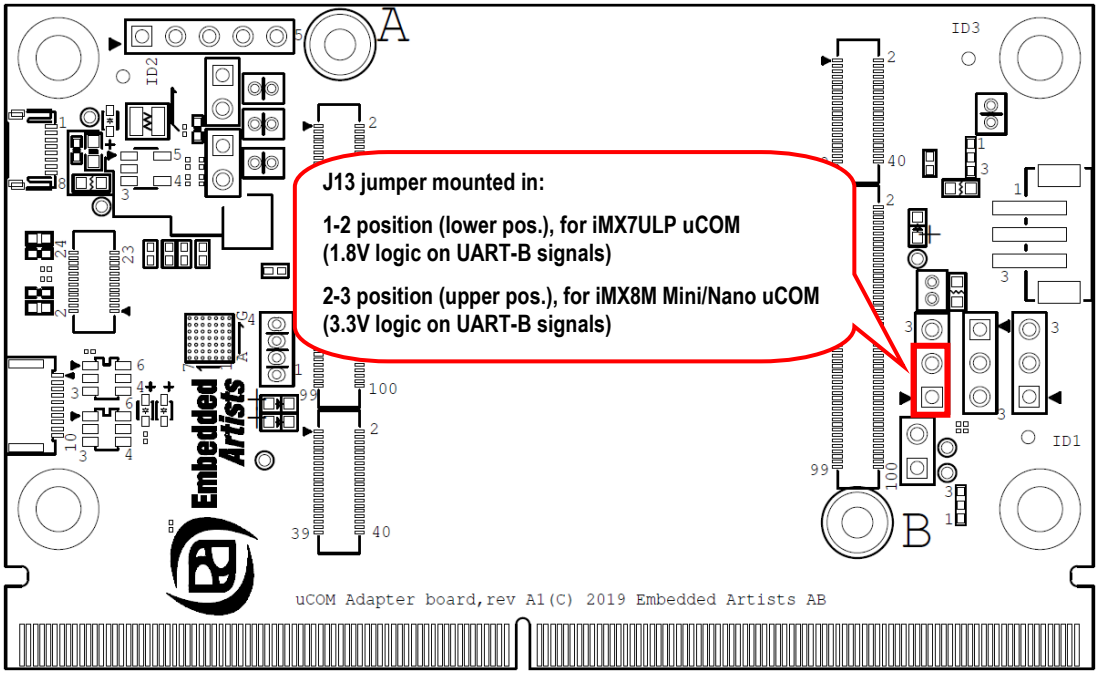


Figure 14 – uCOM Adapter Board rev A1, J13 Location, Top Side

## 12.7 ESD Precaution when handling iMX8M Mini uCOM Board

Please note that the *iMX8M Mini uCOM Board* come without any case/box and all components are exposed for finger touches – and therefore extra attention must be paid to ESD (electrostatic discharge) precaution, for example use of static-free workstation and grounding strap. Only qualified personnel shall handle the product.

***Make it a habit always to first touch the mounting hole (which is grounded) for a few seconds with both hands before touching any other parts of the boards.*** That way, you will have the same potential as the board and therefore minimize the risk for ESD.

In general, touch as little as possible on the boards in order to minimize the risk of ESD damage. The only reasons to touch the board are when mounting/unmounting it on a carrier board.

***Note that Embedded Artists does not replace boards that have been damaged by ESD.***

## 12.8 EMC / ESD

The *iMX8M Mini uCOM Board* has been developed according to the requirements of electromagnetic compatibility (EMC). Nevertheless, depending on the target system, additional anti-interference measurement may still be necessary to adhere to the limits for the overall system.

The *iMX8M Mini uCOM Board* must be mounted on carrier board (typically an application specific board) and therefore EMC and ESD tests only make sense on the complete solution.

No specific ESD protection has been implemented on the *iMX8M Mini uCOM Board*. ESD protection on board level is the same as what is specified in the i.MX 8M Mini SoC datasheet. **It is strongly advised to implement protection against electrostatic discharges (ESD) on the carrier board** on all signals to and from the system. Such protection shall be arranged directly at the inputs/outputs of the system.

## 12.9 uCOM Adapter Board rev A/A1 and J12 Usage

This section is only relevant if you have an iMX8M Mini uCOM Developer's Kit V2. **Skip it if you have an iMX8M Mini uCOM Developer's Kit V3.**

The *uCOM Adapter Board* is designed to support different uCOM modules that can have slightly different behavior and functionality. Most uCOM boards control the PERI_PWR_EN signal from hardware. For these boards J12 shall be in the default 1-2 position. When using UUU to download new images, the console (UART) will work as expected.

When using the iMX7ULP uCOM board, the signal PERI_PWR_EN signal is controlled from the Cortex-M4 application. On an unprogrammed board (from production), signal PERI_PWR_EN is always inactive and the console (UART) communication channel will then not be powered. By moving J12 to 2-3 position, signal PERI_PWR_EN is a copy of the reset signal and will allow the console (UART) will work as expected even though the Cortex-M4 application is not programmed.

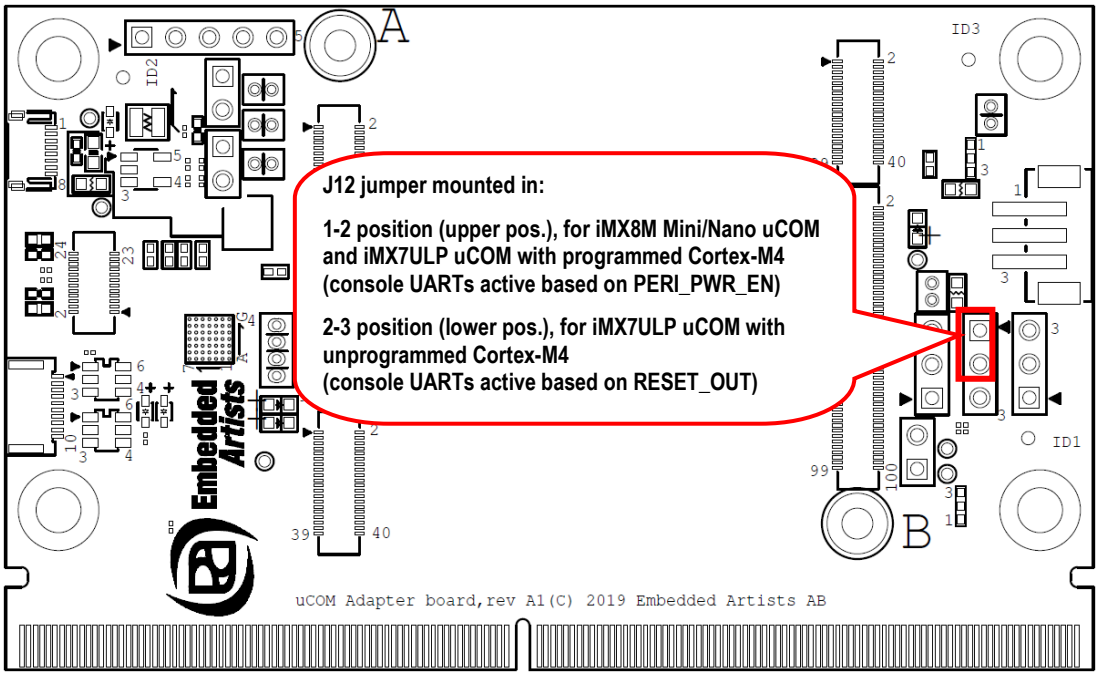


Figure 15 – uCOM Adapter Board rev A/A1, J12 Location, Top Side

## 12.10 Only Use EA Board Support Package (BSP)

The *iMX8M Mini uCOM board* uses multiple on-board interfaces for the internal design, for example PMIC, eMMC and watchdog. Only use the BSP that is delivered from Embedded Artists. Do not change interface initialization and/or pin assignment for the on-board interfaces. Changing BSP settings can result in permanent board failure.

***Note that Embedded Artists does not replace iMX8M Mini uCOM Boards that have been damaged because of improper interface initialization and/or improper pin assignment.***

## 12.11 OTP Fuse Programming

The i.MX 8M Mini SoC has on-chip OTP fuses that can be programmed, see NXP documents *iMX 8M Mini Datasheet* and *iMX 8M Mini Reference Manual* for details. Once programmed, there is no possibility to reprogram them.

*iMX8M Mini uCOM Boards* are delivered without any OTP fuse programming. It is completely up to the COM board user to decide if OTP fuses should be programmed and, in that case, which ones.

***Note that Embedded Artists does not replace iMX8M Mini uCOM Boards because of wrong OTP programming. It's the user's responsibility to be absolutely certain before OTP programming and not to program the fuses by accident.***

## 12.12 Write Protect on Parameter Storage E2PROM

There is an on-board I2C-E2PROM connected to I2C-channel #1 with 7-bit address 0x55 (8-bit address 0xAA/0xAB). The parameter storage E2PROM contains important system data like DDR memory initialization settings and Ethernet MAC addresses. The content should not be erased or overwritten. The E2PROM is write protected if signal ISP_ENABLE (JB pin 100 on DF40C connector and P146/300 on MXM3 connector) is left unconnected, i.e. floating. This should always be the case.

**Note that all carrier board design should include the possibility to ground this pin.**

The signal ISP_ENABLE has dual functions. By pulling the signal low, the i.MX 8M Mini SoC will boot into USB OTG boot mode (also called 'serial download' or 'factory recovery' mode).

***Note that it is not possible to connect an external I2C-device to IC2-channel #1 on the carrier board with this address (since this address is taken by the on-board parameter storage memory).***

## 12.13 Integration - Contact Embedded Artists

It is strongly recommended to contact Embedded Artists at an early stage in your project. A wide range of support during evaluation and the design-in phase are offered, including but not limited to:

- iMX Developer's Kit to simplify evaluation
- Custom Carrier board design, including 'ready-to-go' standard carrier boards
- Display solutions
- Mechanical solutions
- Schematic review of customer carrier board designs
- Driver and application development

The *iMX8M Mini uCOM Board* targets a wide range of applications, such as:

- HMI/GUI solutions
- Connected vending machines
- Point-of-Sale (POS) applications
- Access control panels
- Audio
- IP phones
- Smart appliances
- Home energy management systems
- Industrial automation
- HVAC Building and Control Systems
- Smart Grid and Smart Metering
- Smart Toll Systems

- Data acquisition
- Communication gateway solutions
- Connected real-time systems
- ...and much more

For more harsh use and environments, and where fail-safe operation, redundancy or other strict reliability or safety requirements exists, always contact Embedded Artists for a discussion about suitability.

There are application areas that the *iMX8M Mini uCOM Board* is not designed for (and such usage is strictly prohibited), for example:

- Military equipment
- Aerospace equipment
- Control equipment for nuclear power industry
- Medical equipment related to life support, etc.
- Gasoline stations and oil refineries

If not before, **it is essential to contact Embedded Artists before production begins**. In order to ensure a reliable supply for you, as a customer, we need to know your production volume estimates and forecasts. Embedded Artists can typically provide smaller volumes of the *iMX8M Mini uCOM Board* directly from stock (for evaluation and prototyping), but **larger volumes need to be planned**.

**The more information you can share with Embedded Artists about your plans, estimates and forecasts the higher the likelihood is that we can provide a reliable supply to you of the *iMX8M Mini uCOM Board*.**

# 13 Custom Design

This document specifies the standard *iMX8M Mini uCOM Board* design. Embedded Artists offers many custom design services. Contact Embedded Artists for a discussion about different options.

Examples of custom design services are:

- Mounting a Wi-Fi/BT module.
- Different memory sizes on SDRAM and eMMC Flash.
- Different I/O voltage levels on all or parts of the pins.
- Different mounting options, for example remove Ethernet interface.
- Different pinning on DF40C connectors.
- Different board form factor, for example SODIMM-200, high-density connectors on bottom side or MXM3 compatible boards that are higher (>50 mm).
- Different input supply voltage range.
- Single Board Computer solutions, where the core design of the *iMX8M Mini uCOM Board* is integrated together with selected interfaces.
- Changed internal pinning to make certain pins available.

Embedded Artists also offers a range of services to shorten development time and risk, such as:

- Standard Carrier boards ready for integration
- Custom Carrier board design
- Display solutions
- Mechanical solutions

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