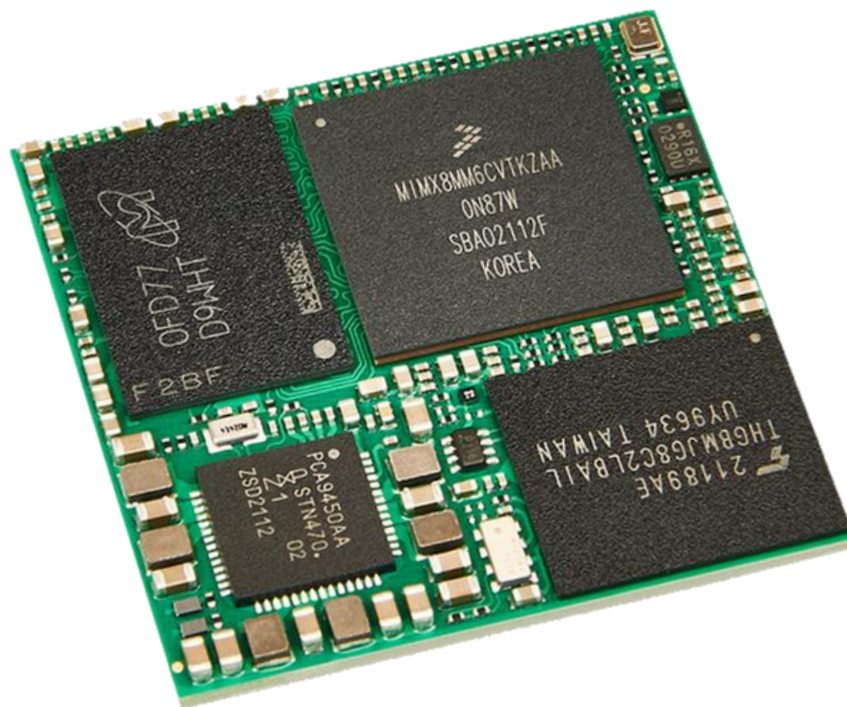




OSM-S i.MX8M Mini

Doc. Rev 1.0

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Revision History

Table 1: Revision History

Revision	Brief Description of Changes	Date of Issue	Author/Editor
0.1	Basic draft	2021-04-21	Gb
0.2	Updated pin mux table	2022-01-14	Ar
0.3	Updated product name	2022-03-08	Gb
0.4	Change to OSM V1.1	2022-04-27	Gb
0.5	Typo correction Updated pin mux table	2023-03-16	Gb
1.0	Official release	2026-07-22	Gb, Tur, We

Terms and Conditions

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Customer Comments

If you have any difficulties using this user guide, discover an error, or just want to provide some feedback, contact support@kontron-electronics.de. Detail any errors you find. We will correct the errors or problems as soon as possible and provide the revised user guide.

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3 Symbols

The following Symbols may be used in this user guide:



DANGER

Indicates an imminently hazardous situation, which, if not avoided, will result in death or serious injury.



WARNING

Indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury.



CAUTION

Indicates a potentially hazardous situation which, if not avoided, may result in minor or moderate injury. It may also be used to alert against unsafe practices.



NOTICE

Indicates a property damage message.



ESD Sensitive Device

This symbol and title inform that the electronic boards and their components are sensitive to static electricity. Care must always therefore be taken during all handling operations and inspections of this product in order to ensure product integrity at all times.



HOT Surface

Do NOT touch! Allow to cool before servicing.



Information

This symbol indicates general information about the product and the user guide.



Hints and Tips

This symbol precedes helpful hints and tips for daily use.

4 Safety Instructions

Before you begin the installation and operation of the product, please carefully read all safety instructions and warnings. Pay attention to any warning notices attached. Kontron Electronics accepts no liability for damage to equipment or persons resulting from failure to follow the basic safety instructions, even during the warranty period, and is therefore exempt from statutory liability for accidents. The product has been designed and tested in accordance with basic safety requirements and legal guidelines. To ensure safe operation, the user must not only observe the intended operating conditions of the product but also follow the basic safety instructions:

- The product must be used in accordance with the user guide or datasheet.
- All instructions for installation, operation, maintenance, transport or storage that are necessary for the safety of the product or the user must be followed.
- The electrical connection on site must comply with the requirements of the local, country-specific regulations.
- Do not place the appliance near heat sources or in damp locations.
- The only way to completely disconnect the product from the mains power is to disconnect the power supply cable from the power adapter or from the product itself.
- Note: The product is not disconnected from the power supply when it is switched off using the power button or the software.
- Only original accessories approved by Kontron Electronics may be used.
- The available interfaces may only be used with devices and components that comply with the specifications listed in the user guide.
- Ensure that the power consumption of the product does not exceed the value specified on the rating plate and in the user-guide.
- If the product stops working properly, switch it off and secure it to prevent it from being turned on again.
- Basic ESD protection measures must be observed (see user guide).



CAUTION: Risk of Overheating

Sufficient air circulation or cooling is essential to protect the product from overheating. When cooling by air circulation, make sure that the ventilation openings and heat sinks of the product are not covered. Overheating can affect the proper functioning of the product and, in the worst case, lead to its destruction. High ambient temperatures can make cooling more difficult. The ambient temperature limits specified in the user guide must be observed.



CAUTION: Hot Surface

There is a risk of injury from contact with heated components or the housing.

5 Instructions on Handling, Unpacking and Usage

5.1 ESD („Electrostatic Discharge“)



ESD Sensitive Device

Electrostatic discharge (ESD) can damage equipment and impair electrical circuitry.

- Wear ESD-protective clothing and shoes.
- Wear an ESD-preventive wrist strap attached to a good earth ground.
- Check the resistance value of the wrist strap periodically (OK: 1 MΩ to 10 MΩ).
- Transport and store the board in its antistatic bag.
- Handle the board at an approved ESD workstation.
- Handle the board only by the edges.

Do not handle this product out of its protective enclosure while it is not used for operational purposes unless it is otherwise protected.

Whenever possible, unpack or pack this product only at EOS/ESD safe workstations. Where a safe workstation is not guaranteed, it is important for the user to be electrically discharged before touching the product with hands or tools.

It is particularly important to observe standard anti-static precautions when changing piggybacks, ROM devices, jumper settings etc. If the product contains batteries for RTC or memory backup, ensure that the product is not placed on conductive surfaces, including anti-static plastics or sponges. They can cause short circuits and damage the batteries or conductive circuits on the product.

5.2 Packaging

All parts are delivered in a product specific package or tray designed to provide adequate protection and absorb shock. Kontron Electronics recommends keeping the packaging to store or transport the product. If it is necessary to store or ship the product then repack it in the same manner as it was delivered.

Please inspect the delivery immediately upon receipt for completeness and integrity. Check the product, the packaging, and any seals that may be present for visible damage or signs of tampering.

If you notice any discrepancies, damage, or missing components, please contact our support team without delay.



Unpacking

Proceed as follows to unpack the unit:

- Remove packaging.
- Do not discard the original packaging. Keep packaging for future relocation or storage.
- Check the delivery for completeness by comparing it with the original order.
- Keep the associated paperwork. It contains important information for handling the unit.
- Check the contents for visible shipping damage.

5.3 Scope of Delivery

Please check your delivery carefully for completeness and check the product, packaging and any seals for damage.

Included in this delivery:

- OSM-S i.MX8M Mini
- Safety instructions

5.4 General Instructions on Usage

In order to maintain Kontron Electronics' product warranty, this product must not be altered or modified in any way. Changes or modifications to the product, that are not explicitly approved by Kontron Electronics and described in this user guide or received from Kontron Electronics Support as a special handling instruction, will void your warranty.

This product should only be installed in or connected to systems that fulfil all necessary technical and specific environmental requirements. This also applies to the operational temperature range of the specific board version that must not be exceeded. If batteries are present, their temperature restrictions must be considered.

In performing all necessary installation and application operations, only follow the instructions supplied by the present user guide.

6 Introduction

This user guide describes the 30 mm x 30 mm SoM form factor module - OSM-S i.MX8M Mini.

The Advanced RISC Machines (ARM) based module is equipped with NXP i.MX8M Mini processor. The quad core SoC takes advantage of the optimized power consumption and performance ratio.

The use of this user guide implies a basic knowledge of PC hardware and software. This user guide is focused on describing the special features and is not intended to be a standard PC textbook. New users are recommended to study the short installation procedure, before switching on the power.

All configuration and setup of the module is performed using the u-Boot CLI. Latest revision of this user guide, datasheet, and BSPs (Board Support Packages) can be downloaded from Kontron Electronics Web Pages.



Exploring the OSM-S i.MX8M Mini

Before working with the OSM-S i.MX8M Mini, Kontron Electronics recommends that users take a few minutes to learn about the various parts of the OSM-S i.MX8M Mini.

7 Product Overview

The OSM-S i.MX8M Mini is a very small System-on-Module (SoM) using NXP's i.MX8M Mini processor with ARM Quad Cortex A53 and Cortex M7. The OSM-S i.MX8M Mini is a highly integrated, small sized module for integration in embedded systems with 30 mm x 30 mm footprint. The module is compatible with SGETs OSM standard Size-S version 1.1. The complexity of the DDR4 memory, power management and processor connection are contained in the SoM and simplifies baseboard development.



Information

All variants are also available as a separate product named Board-Line BL i.MX8M Mini as a baseboard with soldered-on OSM-S i.MX8M Mini.

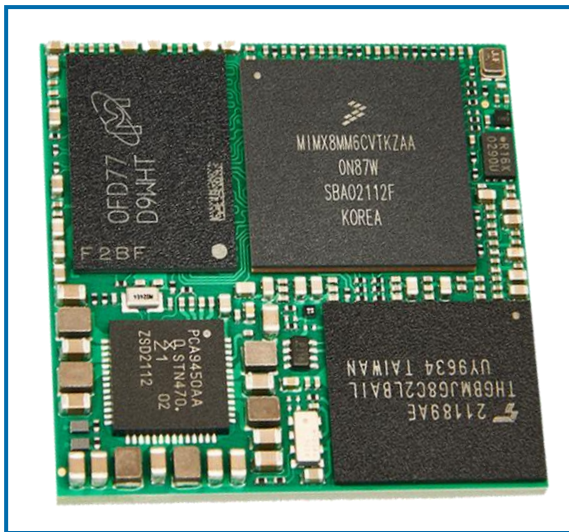


Figure 1: 30x30mm SoM with LGA Package

7.1 Main Characteristics

OSM SoMs combine a microprocessor (CPU), flash and RAM as well as the power supply on a compact circuit board. The large number of communication interfaces are connected via contact pads on the rear side of the module. The SoMs are soldered onto corresponding carrier boards so that no additional connectors are required. They therefore represent a powerful computer core for creating individual applications.

Main characteristics of the OSM-S i.MX8M Mini are:

- NXP i.MX8M Mini
- 4 x Arm® Cortex-A53 @1.6 GHz and 1 x Arm® Cortex®-M4 @400 MHz
- 1 GByte to 4 GByte LPDDR4 RAM
- 4 GByte up to 128 GByte eMMC memory
- 2 MB QSPI boot flash
- 1x 1 Gbit/s IEEE 1588 ethernet
- 8 kByte (64 kbit) EEPROM
- 2 x USB 2.0
- 1x PCIe, 1x I2S (SAI)
- 2x SDIO (1x 4bit, 1x 8bit)
- Form factor 30 mm x 30 mm, OSM-Size S

7.2 Product Variants

Table 2: Product Variants of OSM-S i.MX8M Mini

SoM	Description	Product Number
OSM-S i.MX8M Mini 1GB/8GB -25...+85°C	SoM with NXP i.MX8M Mini quad core processor, 1 GB LPDDR4 and 8 GB eMMC	40099 227
OSM-S i.MX8M Mini 2GB/8GB -25...+85°C	SoM with NXP i.MX8M Mini quad core processor, 2 GB LPDDR4 and 8 GB eMMC	40099 229
OSM-S i.MX8M Mini 4GB/32GB -25...+85°C	SoM with NXP i.MX8M Mini quad core processor, 4 GB LPDDR4 and 32 GB eMMC	40099 231
Other systems on request		

7.3 Related Products

The following products are available with the i.MX8M Mini SoC.

Table 3: Related Products of OSM-S i.MX8M Mini

Product	Product Category	Details
OSM-S i.MX8M Mini	OSM	Open Standard Module 1.1 Size S
SL i.MX8M Mini	SoM Line	KED Standard
BL i.MX8M Mini	Board Line	including soldered-on SL i.MX8M Mini
DK i.MX8M Mini	Development Kit	including BL i.MX8M Mini
DK 7" i.MX8M Mini	Development Kit	including BL i.MX8M Mini + 7" Touch display
AL i.MX8M Mini	Automation Line	including BL i.MX8M Mini + Housing
AL i.MX8M Mini QC LTE	Automation Line	including BL i.MX8M Mini + LTE Module + Housing
DL i.MX8M Mini	Display Line	including BL i.MX8M Mini + Touch display + Housing

Figure 2: Different variants of DK i.MX8M Mini



8 System Specifications

8.1 Component Main Data

The table below summarizes the features of OSM-S i.MX8M Mini.

Table 4: Component Main Data

OSM-S i.MX8M Mini	
Form factor	OSM 1.1 Size-S 30 x 30 mm with 332 LGA pads
Processor	NXP's MIMX8MM6CVTKZAA with 14mm x 14mm BGA package in 0.5mm pitch (industrial version) up to 1.6 GHz
Memory	1.6 GHz 32-bit LPDDR4 1 GByte: 1x 8 Gbit density 256 M x32 LPDDR4 parts 2 GByte: 1x 16 Gbit density 512 M x32 LPDDR4 parts 4 GByte: 1x 32 Gbit density 1024 M x32 LPDDR4 parts
Stronge (eMMC)	up to 128 GByte TLC connected on SD1
Flash	2 MB SPI NOR flash in USON (2x3mm) package connected on ECSP11
EEPROM	8 kByte EEPROM on I2C1
Power Management	PCA9450AHN from NXP
Default Interfaces	
LAN	1x Gigabit Ethernet IEEE 1588, Ethernet AVB, no phy on SoM
USB	2x USB 2.0
Display	1x MIPI DSI (4-lane) - up to 1920 x 1200 @60fps
Camera	1x MIPI CSI (4-lane)
SD-Card	2x SDIO (1x 4bit, 1x 8bit)
UART	4x (1x console, 3x general purpose)
GPIO	24x GPIO
I2C	2x (general purpose)
PWM	3x
CAN	No CAN
SPI	2x SPI
Audio	1x SAI (I2S)
PCIe	1x PCIe
Other Features	
RTC	1x RV-3028-C7 on I2C1, 45 nA @ 3 V, factory calibrated to ±1 ppm @ 25°C
Power	
Consumption	<3,5 W
Input Voltage	Single Supply 5 V ±5 %
Software	
Operating System Support	Embedded Linux (Yocto Distribution)

8.2 Environmental Conditions

Table 5: Environmental Conditions

Operating	industrial: -25°C...+85°C relative humidity (non-condensing) 10 % to 93 % at 40 °C
Storage	commercial grade: -40 °C to +85 °C relative humidity (non-condensing) 10 % to 93 % at 40 °C



Cooling

The OSM-S i.MX8M Mini is designed for operation in a customer-specific enclosure or device. Please do not operate the OSM-S i.MX8M Mini without sufficient cooling system. The maximum temperature range refers only to the limits of the individual components. Do not place heat sources in close proximity to the product. This could otherwise lead to performance losses or an unexpected shutdown of the device.

8.3 Mechanical Specification

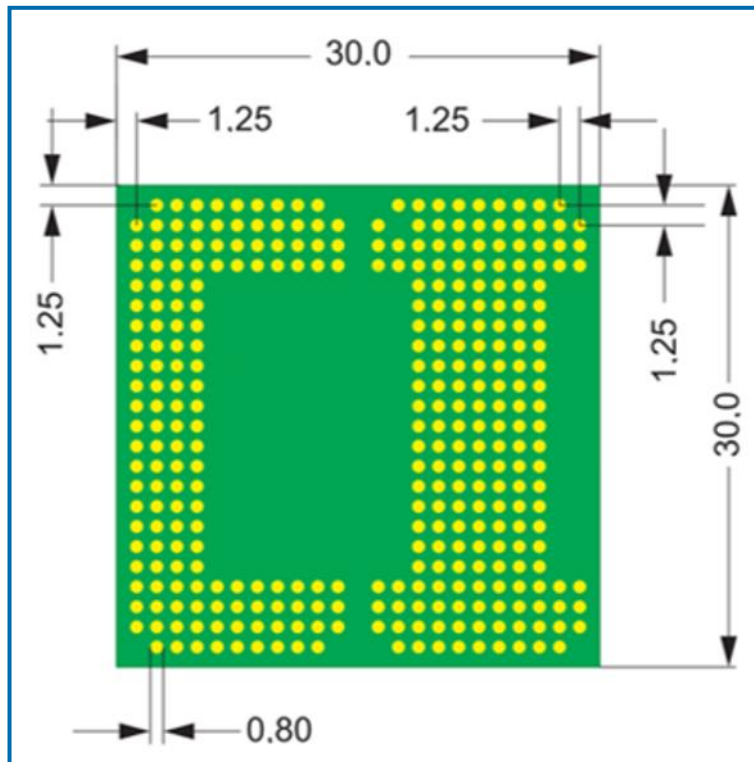


Figure 3: Dimensions of OSM S.i.MX8M Mini (top side view)

Table 6: Mechanical Dimensions

Dimension	Description
Size	30 mm x 30 mm
PCB Thickness	1.5 mm $\pm$ 0.1 mm
Total height	2.5 mm $\pm$ 0.1 mm
Weight (approx.)	4.7 g

8.4 Functional Block Diagram

The block diagram shows a detailed structure of the OSM-S i.MX8M Mini module.

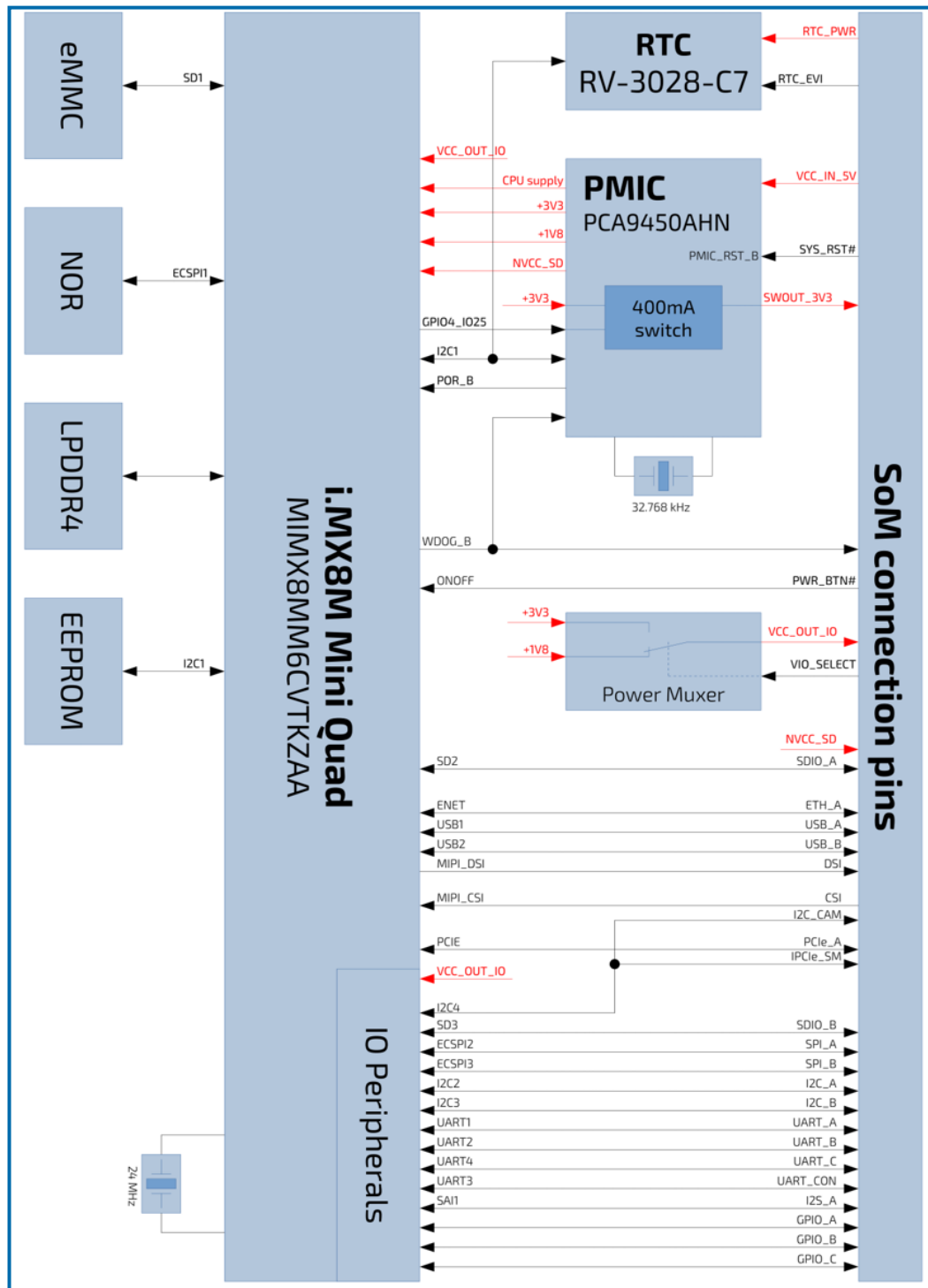


Figure 4: Block Diagram

8.5 Module Layout and Components

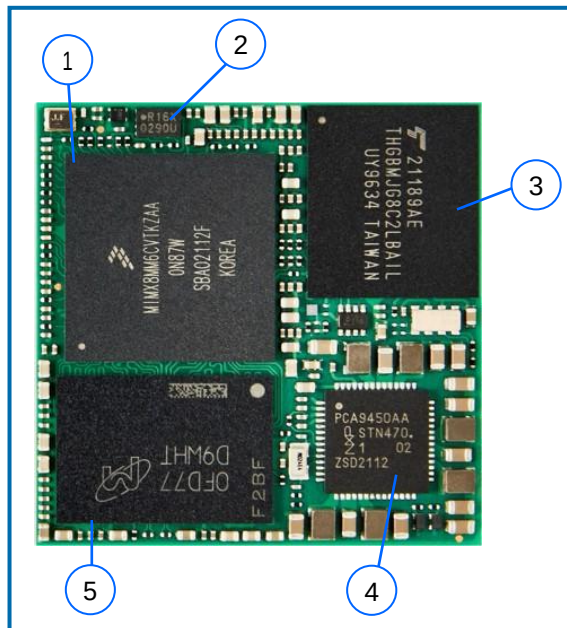


Figure 5: Top Side View

Number	Object
1	CPU
2	NOR-Flash
3	eMMC
4	PMIC
5	eMMC

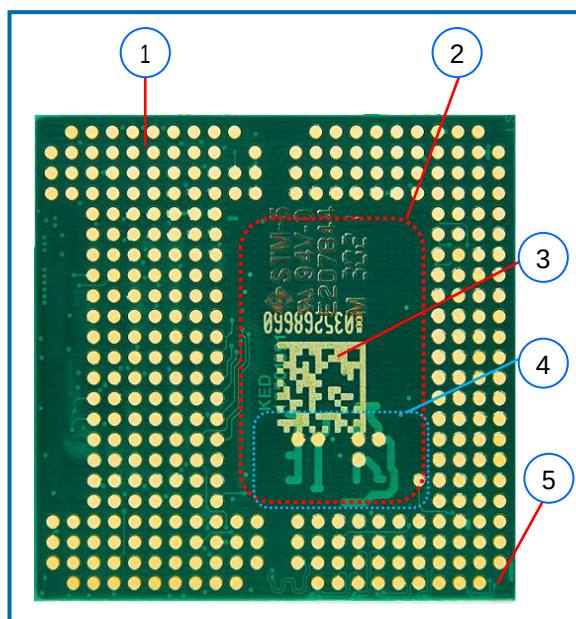


Figure 6: Bottom Side View

Number	Pins
1	OSM pads
2	Keep out area on base board
3	Unique ID
4	Test points (factory use only)
5	Pin A1 (missing)

8.6 Thermal Considerations



CAUTION hot Surface

There is a risk of injury from touching heated components or the SoM.

- Do not touch the SoM when the product is in operation.
- Allow the product to cool before handling.
- Wear protective gloves.
- Always turn the product off when not in use.



Information

The OSM-S i.MX8M Mini is designed for operation in a customer-specific enclosure or device. Please do not operate the OSM-S i.MX8M Mini without sufficient cooling system. The maximum temperature range refers only to the limits of the individual components.

8.7 Standards, Certifications and Directives

The OSM-S i.MX8M Mini has been designed and tested in accordance with the following standards:

Table 7: Standards, Certifications and Directives Compliance

CE-Mark Compliant with EU Directives	RoHS II	Directive 2011/65/EU + (EU)2015/863
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9 Pinout

9.1 Pinout Diagram

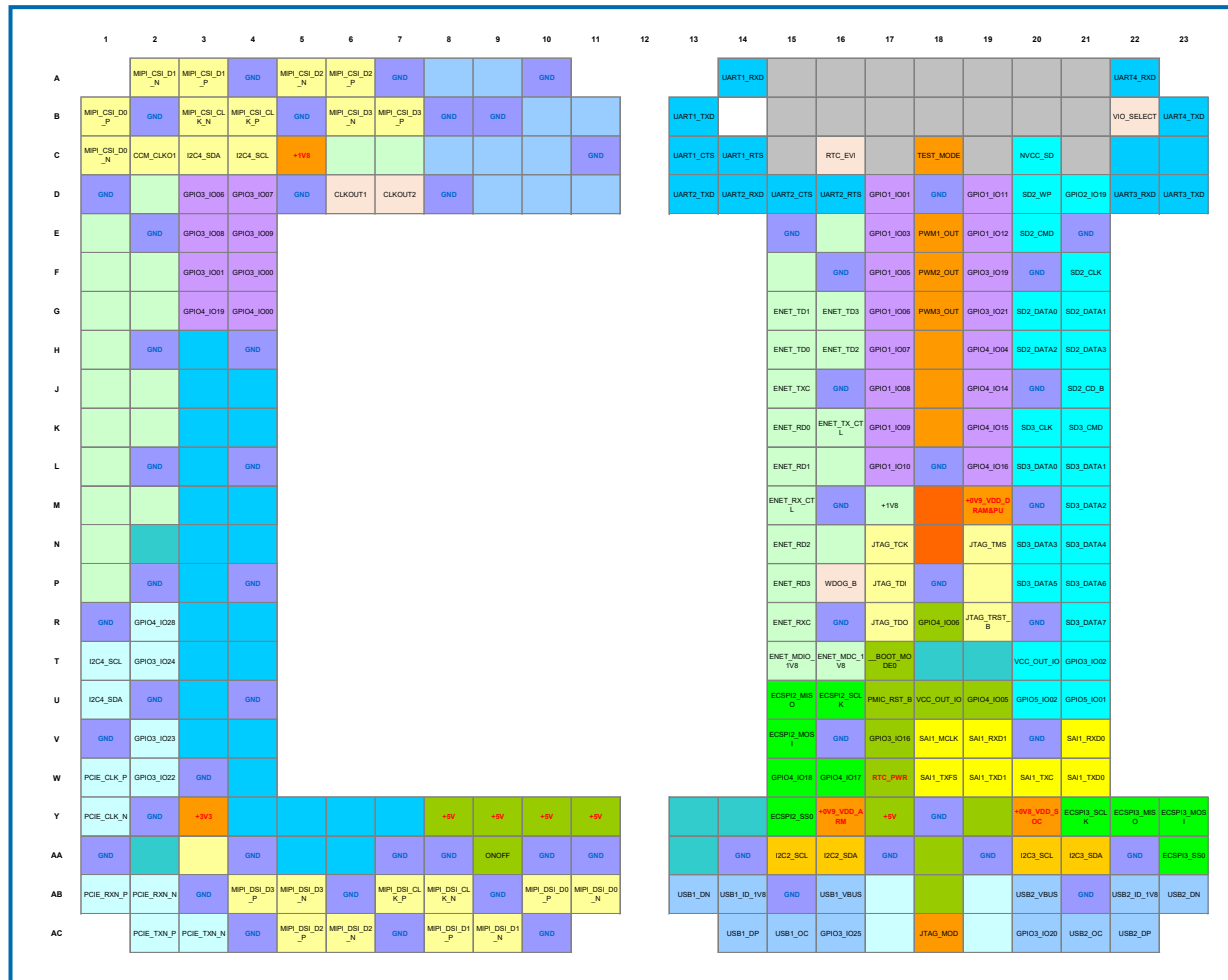


Figure 7: Pin Assignment (top view)



NOTICE

The pin names shown in Figure 6 are for reference only and may vary. The valid pin names and corresponding functions are provided in the table below.

9.2 OSM-S Pinout

The pinout described here is the default pinout of the SoM in comparison to the OSM pinout. One can use "*Pins Tool for i.MX Application Processors*" to change the multiplexing. The tool can be downloaded from NXP homepage.



NOTICE

Changing multiplexing creates the need of changing the device tree too.

Table 8: Pinout of OSM-S i.MX8M Mini

Contact Name OSM	Contact Acronym	CPU Contact	Signal Name	Functional Description	I/O Type	I/O Level	PU / PD	Comments
VCC_2_TEST	M19		+0V9_VDD_DRAM&PU	Module power voltage testpoint	P			for testing only
VCC_3_TEST	Y16		+0V9_VDD_ARM	Module power voltage testpoint	P			for testing only
VCC_4_TEST	Y20		+0V8_VDD_SOC	Module power voltage testpoint	P			for testing only
VCC_IN_5V	Y17		+5V	Module power input voltage of 5V – Primary voltage rail for size S, M and L modules	P			Tolerance: 5V +-5%
VCC_IN_3V3	Y19							
V_BAT	AA18, AB18							
GND	D18, E15, E21, F16, F20, J16, J20, L18, M16, M20, P18, R16, R20, V16, V20, Y18, AA14, AA17, AA19, AA22, AB15, AB21	GND	GND	Module Signal and power return and GND reference	P			
SYS_RST#	U17		PMIC_RST_B	Reset input from Carrier board. Carrier drives low to force a Module reset, floats the line otherwise.	I OD CMOS	1.8V	PU 100K	PU is inside PMIC. External PU 100k needed to support boundary scan
CARRIER_PWR_EN	V17	NAND_READY_B	GPIO3_IO16	Carrier board circuits should not be powered up until the module asserts the CARRIER_PWR_EN signal	O CMOS	V_OUT_IO		
VCC_OUT_IO	U18		VCC_OUT_IO	Provides IO voltage level for several interfaces to connect	PO	1.8V/3.3V		IO Power Output. Voltage level selected by VIO_SELECT. Maximum 500 mA.
RTC_PWR	W17		RTC_PWR	Low current RTC circuit backup power – 3.0V nominal. May be sourced from a Carrier based Lithium cell or Super Cap.	P			

Contact Name OSM	Contact Acronym	CPU Contact	Signal Name	Functional Description	I/O Type	I/O Level	PU / PD	Comments
BOOT_SEL0#	U19	SAI1_RXD3	GPIO4_IO05		I OD CMOS	1.8V	PU 10k	Not supported. Leave floating
BOOT_SEL1#	R18	SAI1_RXD4	GPIO4_IO06		I OD CMOS	1.8V	PU 10k	Not supported. Leave floating
FORCE_RECOVERY#	T17	BOOT_MODE0	__BOOT_MODE0	If low on carrier board module enters recovery mode.	I OD CMOS	V_OUT_IO	PU 10k	float: normal operation (boot from fuses) low: Recovery Mode
JTAG_TCK(SWCLK)	N17	JTAG_TCK	JTAG_TCK	Test Clock	I CMOS	V_OUT_IO		PD 10k should be placed on base board
JTAG_TMS(SWDIO)	N19	JTAG_TMS	JTAG_TMS	Test Mode Select	I CMOS	V_OUT_IO		
JTAG_TDI	P17	JTAG_TDI	JTAG_TDI	Test Data Input	I CMOS	V_OUT_IO		
JTAG_RTCK	P19							
JTAG_TDO(SWO)	R17	JTAG_TDO	JTAG_TDO	Test Data Output	O CMOS	V_OUT_IO		
JTAG_nTRST	R19	JTAG_TRST_B	JTAG_TRST_B	Test Reset, Active Low	I CMOS	1.8V		
DEBUG_EN	AC18	JTAG_MOD	JTAG_MOD	Enables JTAG function	I CMOS	1.8V	PD 10k	
TEST_GENERIC	C18	TEST_MODE	TEST_MODE	General purpose for testing	I/O CMOS	V_OUT_IO	PD 100k	The TEST_GENERIC function should be specified by module vendor.
UART_A_RX	A14	SAI2_RXC	UART1_RXD	Asynchronous serial data input port A	I CMOS	V_OUT_IO		
UART_A_TX	B13	SAI2_RXFS	UART1_TXD	Asynchronous serial data output port A	O CMOS	V_OUT_IO		
UART_A_RTS	C13	SAI2_TXFS	UART1_CTS	"Request to Send" handshake line for port A	O CMOS	V_OUT_IO		
UART_A_CTS	C14	SAI2_RXD0	UART1_RTS	"Clear to Send" handshake line for port A	I CMOS	V_OUT_IO		
UART_B_RX	D14	SAI3_TXFS	UART2_RXD	Asynchronous serial data input port B	I CMOS	V_OUT_IO		
UART_B_TX	D13	SAI3_TXC	UART2_TXD	Asynchronous serial data output port B	O CMOS	V_OUT_IO		
UART_B_RTS	D15	SAI3_RXC	UART2_CTS	"Request to Send" handshake line for port B	O CMOS	V_OUT_IO		
UART_B_CTS	D16	SAI3_RXD	UART2_RTS	"Clear to Send" handshake line for port B	I CMOS	V_OUT_IO		
UART_C_RX	A22	UART4_RXD	UART4_RXD	Asynchronous serial data input port C	I CMOS	V_OUT_IO		
UART_C_TX	B23	UART4_TXD	UART4_TXD	Asynchronous serial data output port C	O CMOS	V_OUT_IO		
UART_D_RX	C22							
UART_D_TX	C23							
UART_CON_RX	D22	UART3_RXD	UART3_RXD	Asynchronous serial data input port console	I CMOS	V_OUT_IO		
UART_CON_TX	D23	UART3_TXD	UART3_TXD	Asynchronous serial data output port console	O CMOS	V_OUT_IO		
ETH_A_(R)(G)MII_CRS	E16							
ETH_A_(R)(G)MII_COL	F15							
ETH_A_(S)(R)(G)MII_TXD0	H15	ENET_TD0	ENET_TD0	Transmit data bit 0 (transmitted first) port A	O CMOS	1.8V		
ETH_A_(S)(R)(G)MII_TXD1	G15	ENET_TD1	ENET_TD1	Transmit data bit 1 port A	O CMOS	1.8V		
ETH_A_(S)(R)(G)MII_TXD2	H16	ENET_TD2	ENET_TD2	Transmit data bit 2 port A	O CMOS	1.8V		
ETH_A_(S)(R)(G)MII_TXD3	G16	ENET_TD3	ENET_TD3	Transmit data bit 3 port A	O CMOS	1.8V		

Contact Name OSM	Contact Acronym	CPU Contact	Signal Name	Functional Description	I/O Type	I/O Level	PU / PD	Comments
ETH_A_(R)(G)MII_TX_EN(ER)	K16	ENET_TX_CTL	ENET_TX_CTL	Transmit enable (Error) port A	O CMOS	1.8V		
ETH_A_(R)(G)MII_TX_CLK	J15	ENET_TXC	ENET_TXC	Transmit clock port A	I/O CMOS	1.8V		
ETH_A_(S)(R)(G)MII_RXD0	K15	ENET_RD0	ENET_RD0	Receive data bit 0 (received first) port A	I CMOS	1.8V		
ETH_A_(S)(R)(G)MII_RXD1	L15	ENET_RD1	ENET_RD1	Receive data bit 1 port A	I CMOS	1.8V		
ETH_A_(R)(G)MII_RXD2	N15	ENET_RD2	ENET_RD2	Receive data bit 2 port A	I CMOS	1.8V		
ETH_A_(R)(G)MII_RXD3	P15	ENET_RD3	ENET_RD3	Receive data bit 3 port A	I CMOS	1.8V		
ETH_A_(R)(G)MII_RX_ER	L16							
ETH_A_(R)(G)MII_RX_DV(ER)	M15	ENET_RX_CTL	ENET_RX_CTL	Receive data valid port A	I CMOS	1.8V		
ETH_A_(R)(G)MII_RX_CLK	R15	ENET_RXC	ENET_RXC	Receive clock port A	I/O CMOS	1.8V		
ETH_A_SDP	N16							
ETH_MDIO	T15	ENET_MDIO	ENET_MDIO_1V8	Management bus data signal for Ethernet	I/O CMOS	1.8V		Can be used for all ETH ports or for A exclusively
ETH_MDC	T16	ENET_MDC	ENET_MDC_1V8	Management bus clock signal for Ethernet	O CMOS	1.8V		Can be used for all ETH ports or for A exclusively
ETH_IOPWR	M17		+1V8	ETH voltage. It is used to provide the IO Voltage Level for all Ethernet interfaces.	PO	1.8V		maximum 200 mA
GPIO_A_0	D17	GPIO1_IO01	GPIO1_IO01	General purpose I/O Contact A0	I/O CMOS	V_OUT_IO		
GPIO_A_1	E17	GPIO1_IO03	GPIO1_IO03	General purpose I/O Contact A1	I/O CMOS	V_OUT_IO		
GPIO_A_2	F17	GPIO1_IO05	GPIO1_IO05	General purpose I/O Contact A2	I/O CMOS	V_OUT_IO		
GPIO_A_3	G17	GPIO1_IO06	GPIO1_IO06	General purpose I/O Contact A3	I/O CMOS	V_OUT_IO		
GPIO_A_4	H17	GPIO1_IO07	GPIO1_IO07	General purpose I/O Contact A4	I/O CMOS	V_OUT_IO		
GPIO_A_5	J17	GPIO1_IO08	GPIO1_IO08	General purpose I/O Contact A5	I/O CMOS	V_OUT_IO		
GPIO_A_6	K17	GPIO1_IO09	GPIO1_IO09	General purpose I/O Contact A6	I/O CMOS	V_OUT_IO		Dual function: SPI_A_CS1#
GPIO_A_7	L17	GPIO1_IO10	GPIO1_IO10	General purpose I/O Contact A7	I/O CMOS	V_OUT_IO		Dual function: SPI_B_CS1#
GPIO_B_0	D19	GPIO1_IO11	GPIO1_IO11	General purpose I/O Contact B0	I/O CMOS	V_OUT_IO		
GPIO_B_1	E19	GPIO1_IO12	GPIO1_IO12	General purpose I/O Contact B1	I/O CMOS	V_OUT_IO		
GPIO_B_2	F19	SAI5_RXFS	GPIO3_IO19	General purpose I/O Contact B2	I/O CMOS	V_OUT_IO		
GPIO_B_3	G19	SAI5_RXD0	GPIO3_IO21	General purpose I/O Contact B3	I/O CMOS	V_OUT_IO		
GPIO_B_4	H19	SAI1_RXD2	GPIO4_IO04	General purpose I/O Contact B4	I/O CMOS	V_OUT_IO		
GPIO_B_5	J19	SAI1_TXD2	GPIO4_IO14	General purpose I/O Contact B5	I/O CMOS	V_OUT_IO		
GPIO_B_6	K19	SAI1_TXD3	GPIO4_IO15	General purpose I/O Contact B6	I/O CMOS	V_OUT_IO		
GPIO_B_7	L19	SAI1_TXD4	GPIO4_IO16	General purpose I/O Contact B7	I/O CMOS	V_OUT_IO		
SDIO_A_CMD	E20	SD2_CMD	SD2_CMD	SDIO A Command/Response. This signal is used for card initialization and for command transfers. During initialization mode this	I/O CMOS	1.8V or 3.3V		

Contact Name OSM	Contact Acronym	CPU Contact	Signal Name	Functional Description	I/O Type	I/O Level	PU / PD	Comments
				signal is open drain. During command transfer this signal is in push-pull mode.				
SDIO_A_CLK	F21	SD2_CLK	SD2_CLK	SDIO A Clock. With each cycle of this signal a one-bit transfer on the command and each data line occurs.	O CMOS	1.8V or 3.3V		
SDIO_A_D0	G20	SD2_DATA0	SD2_DATA0	SDIO A Data lines. These signals operate in push-pull mode.	I/O CMOS	1.8V or 3.3V		
SDIO_A_D1	G21	SD2_DATA1	SD2_DATA1	SDIO A Data lines. These signals operate in push-pull mode.	I/O CMOS	1.8V or 3.3V		
SDIO_A_D2	H20	SD2_DATA2	SD2_DATA2	SDIO A Data lines. These signals operate in push-pull mode.	I/O CMOS	1.8V or 3.3V		
SDIO_A_D3	H21	SD2_DATA3	SD2_DATA3	SDIO A Data lines. These signals operate in push-pull mode.	I/O CMOS	1.8V or 3.3V		
SDIO_A_CD#	J21	SD2_CD_B	SD2_CD_B	SDIO A Card Detect. This signal indicates when a SDIO/MMC card is present.	I OD CMOS	1.8V or 3.3V	PU 10k	
SDIO_A_WP	D20	SD2_WP	SD2_WP	SDIO A Write Protect. This signal denotes the state of the write-protect tab on SD cards.	I OD CMOS	1.8V or 3.3V	PU 10k	Tie to GND on carrier, if not used
SDIO_A_PWR_EN	D21	SD2_RESET_B	GPIO2_IO19	SDIO A Power Enable. This signal is used to enable the power being supplied to a SD/MMC card device.	O CMOS	1.8V or 3.3V		
SDIO_A_IOPWR	C20	NVCC_SD2	NVCC_SD	SDIO A Voltage. It is used to provide the IO Voltage Level	PO	1.8V or 3.3V		maximum 100 mA
SDIO_B_CLK	K20	NAND_WE_B	SD3_CLK	SDIO B Clock. With each cycle of this signal a one-bit transfer on the command and each data line occurs.	O CMOS	V_OUT_IO		
SDIO_B_CMD	K21	NAND_WP_B	SD3_CMD	SDIO B Command/Response. This signal is used for card initialization and for command transfers. During initialization mode this signal is open drain. During command transfer this signal is in push-pull mode.	I/O CMOS	V_OUT_IO		
SDIO_B_D0	L20	NAND_DATA04	SD3_DATA0	SDIO B Data lines. These signals operate in push-pull mode.	I/O CMOS	V_OUT_IO		
SDIO_B_D1	L21	NAND_DATA05	SD3_DATA1	SDIO B Data lines. These signals operate in push-pull mode.	I/O CMOS	V_OUT_IO		
SDIO_B_D2	M21	NAND_DATA06	SD3_DATA2	SDIO B Data lines. These signals operate in push-pull mode.	I/O CMOS	V_OUT_IO		
SDIO_B_D3	N20	NAND_DATA07	SD3_DATA3	SDIO B Data lines. These signals operate in push-pull mode.	I/O CMOS	V_OUT_IO		
SDIO_B_D4	N21	NAND_RE_B	SD3_DATA4	SDIO B Data lines. These signals operate in push-pull mode.	I/O CMOS	V_OUT_IO		
SDIO_B_D5	P20	NAND_CE2_B	SD3_DATA5	SDIO B Data lines. These signals operate in push-pull mode.	I/O CMOS	V_OUT_IO		
SDIO_B_D6	P21	NAND_CE3_B	SD3_DATA6	SDIO B Data lines. These signals operate in push-pull mode.	I/O CMOS	V_OUT_IO		
SDIO_B_D7	R21	NAND_CLE	SD3_DATA7	SDIO B Data lines. These signals operate in push-pull mode.	I/O CMOS	V_OUT_IO		
SDIO_B_CD#	T21	NAND_CE1_B	GPIO3_IO02	SDIO B Card Detect. This signal indicates when a SDIO/MMC card is present.	I OD CMOS	V_OUT_IO	PU 10k	
SDIO_B_WP	U20	SAI3_MCLK	GPIO5_IO02	SDIO B Write Protect. This signal denotes the state of the write-protect tab on SD cards.	I OD CMOS	V_OUT_IO	PU 10k	Tie to GND on carrier, if not used

Contact Name OSM	Contact Acronym	CPU Contact	Signal Name	Functional Description	I/O Type	I/O Level	PU / PD	Comments
SDIO_B_PWR_EN	U21	SAI3_TXD	GPIO5_IO01	SDIO B Power Enable. This signal is used to enable the power being supplied to a SD/MMC card device.	O CMOS	V_OUT_IO		
SDIO_B_IOPWR	T20		VCC_OUT_IO	SDIO B Voltage. It is used to provide the IO Voltage Level	PO	V_OUT_IO		maximum 200 mA
PWM_0	E18	SPDIF_EXT_CLK	PWM1_OUT	Pulse width modulation 0	O CMOS	V_OUT_IO		Dual function: DISP_BL_PWM
PWM_1	F18	SPDIF_RX	PWM2_OUT	Pulse width modulation 1	O CMOS	V_OUT_IO		
PWM_2	G18	SPDIF_TX	PWM3_OUT	Pulse width modulation 2	O CMOS	V_OUT_IO		
PWM_3	H18							
PWM_4	J18							
PWM_5	K18							
ADC_0	M18							
ADC_1	N18							
SPI_A_SDI_(IO0)	U15	ECSPI2_MISO	ECSPI2_MISO	SPI A Serial Data Input	IO CMOS	V_OUT_IO		
SPI_A_SDO_(IO1)	V15	ECSPI2_MOSI	ECSPI2_MOSI	SPI A Serial Data Output	IO CMOS	V_OUT_IO		
SPI_A_WP_(IO2)	W16	SAI1_TXD5	GPIO4_IO17	SPI A Write Protect	IO CMOS	V_OUT_IO		
SPI_A_HOLD_(IO3)	W15	SAI1_TXD6	GPIO4_IO18	SPI A Suspends Serial Input	IO CMOS	V_OUT_IO		
SPI_A_CS0#	Y15	ECSPI2_SS0	ECSPI2_SS0	SPI A Master Chip Select 0	O CMOS	V_OUT_IO		
SPI_A_SCK	U16	ECSPI2_SCLK	ECSPI2_SCLK	SPI A Serial Data Clock	O CMOS	V_OUT_IO		
SPI_B_SDI	Y22	UART2_RXD	ECSPI3_MISO	SPI B Serial Data Input	I CMOS	V_OUT_IO		
SPI_B_SDO	Y23	UART1_TXD	ECSPI3_MOSI	SPI B Serial Data Output	O CMOS	V_OUT_IO		
SPI_B_CS0#	AA23	UART2_TXD	ECSPI3_SS0	SPI B Master Chip Select 0	O CMOS	V_OUT_IO		
SPI_B_SCK	Y21	UART1_RXD	ECSPI3_SCLK	SPI B Serial Data Clock	O CMOS	V_OUT_IO		
I2S_A_DATA_IN	V21	SAI1_RXD0	SAI1_RXD0	I2S A Digital audio Input	I/O CMOS	V_OUT_IO		
I2S_A_DATA_OUT	W21	SAI1_TXD0	SAI1_TXD0	I2S A Digital audio Output	I/O CMOS	V_OUT_IO		
I2S_B_DATA_IN	V19	SAI1_RXD1	SAI1_RXD1	I2S B Digital audio Input	I/O CMOS	V_OUT_IO		
I2S_B_DATA_OUT	W19	SAI1_TXD1	SAI1_TXD1	I2S B Digital audio Output	I/O CMOS	V_OUT_IO		
I2S_MCLK	V18	SAI1_MCLK	SAI1_MCLK	Master clock output to I2S codec(s)	I/O CMOS	V_OUT_IO		
I2S_LRCLK	W18	SAI1_TXFS	SAI1_TXFS	I2S Left & Right synchronization clock	I/O CMOS	V_OUT_IO		
I2S_BITCLK	W20	SAI1_TXC	SAI1_TXC	I2S Digital audio clock	I/O CMOS	V_OUT_IO		
CAN_A_TX	AC17							
CAN_A_RX	AB17							
CAN_B_TX	AC19							
CAN_B_RX	AB19							
USB_A_D_N	AB13	USB1_DN	USB1_DN	USB differential data pairs for port A	I/O USB	USB		
USB_A_D_P	AC14	USB1_DP	USB1_DP	USB differential data pairs for port A	I/O USB	USB		

Contact Name OSM	Contact Acronym	CPU Contact	Signal Name	Functional Description	I/O Type	I/O Level	PU / PD	Comments
USB_A_ID	AB14	USB1_ID	USB1_ID_1V8	Input Contact to announce OTG device insertion on USB 2.0 port	I OD CMOS	1.8V	PU 10k	
USB_A_OC#	AC15	GPIO1_IO13	USB1_OC	USB over-current for port A	I OD CMOS	V_OUT_IO	PU 10k	
USB_A_VBUS	AB16		USB1_VBUS	USB port 0 port power detection	I USB VBUS 5V	USB VBUS 5V		
USB_A_EN	AC16	SAI5_MCLK	GPIO3_IO25	Power enable for USB VBUS voltage	O CMOS	V_OUT_IO		
USB_B_D_N	AB23	USB2_DN	USB2_DN	USB differential data pairs for port B	I/O USB	USB		
USB_B_D_P	AC22	USB2_DP	USB2_DP	USB differential data pairs for port B	I/O USB	USB		
USB_B_ID	AB22	USB2_ID	USB2_ID_1V8	Input Contact to announce OTG device insertion on USB 2.0 port	I OD CMOS	1.8V	PU 10k	
USB_B_OC#	AC21	GPIO1_IO15	USB2_OC	USB over-current for port B	I OD CMOS	V_OUT_IO	PU 10k	
USB_B_VBUS	AB20		USB2_VBUS	USB port 0 port power detection	I USB VBUS 5V	USB VBUS 5V		
USB_B_EN	AC20	SAI5_RXC	GPIO3_IO20	Power enable for USB VBUS voltage	O CMOS	V_OUT_IO		
I2C_A_SCL	AA15	I2C2_SCL	I2C2_SCL	I2C Port A Clock Signal	I/O OD CMOS	V_OUT_IO	PU 2k2	
I2C_A_SDA	AA16	I2C2_SDA	I2C2_SDA	I2C Port A Data Signal	I/O OD CMOS	V_OUT_IO	PU 2k2	
I2C_B_SCL	AA20	I2C3_SCL	I2C3_SCL	I2C Port B Clock Signal	I/O OD CMOS	V_OUT_IO	PU 2k2	
I2C_B_SDA	AA21	I2C3_SDA	I2C3_SDA	I2C Port B Data Signal	I/O OD CMOS	V_OUT_IO	PU 2k2	
COM_AREA_01	A15							
COM_AREA_02	A16							
COM_AREA_03	A17							
COM_AREA_04	A18							
COM_AREA_05	A19							
COM_AREA_06	A20							
COM_AREA_07	A21							
COM_AREA_08	B15							
COM_AREA_09	B16							
COM_AREA_10	B17							
COM_AREA_11	B18							
COM_AREA_12	B19							
COM_AREA_13	B20							
COM_AREA_14	B21							
COM_AREA_15	C15							
COM_AREA_16	C17							
COM_AREA_17	C19							
COM_AREA_18	C21							
RESERVED	T18, T19, Y13, Y14, AA13							

Contact Name OSM	Contact Acronym	CPU Contact	Signal Name	Functional Description	I/O Type	I/O Level	PU / PD	Comments
Vendor Defined	B22		VIO_SELECT	sets voltage level of V_OUT_IO	I OD CMOS	1.8V	PU 10k	float: V_OUT_IO=1.8V GND: V_OUT_IO=3.3V
Vendor Defined	C16		RTC_EVI	RTC Event Input	I OD CMOS	RTC_PWR	PU 10k	
Vendor Defined	P16	GPIO1_IO02	WDOG_B	watchdog output from CPU (WDOG_ANY)	O OD CMOS	1.8V		
VCC_5_TEST	Y3		+3V3	Module power voltage test point	PO			can be used on Baseboard. Maximum current 500 mA
VCC_6_TEST	C5		+1V8	Module power voltage test point	PO			can be used on Baseboard. Maximum current 500 mA
VCC_IN_5V	Y8, Y9, Y10, Y11		+5V	Module power input voltage of 5V	P			Tolerance: 5V +-5%
GND	A4, A7, A10, B2, B5, B8, B9, C11, D1, D5, D8, E2, H2, H4, L2, L4, P2, P4, R1, U2, U4, V1, W3, Y2, AA1, AA4, AA7, AA8, AA10, AA11, AB3, AB6, AB9, AC4, AC7, AC10	GND	GND	Module Signal and power return and GND reference	P			
PWR_BTN#	AA9	ONOFF	ONOFF	Power-button input from Carrier board. Carrier to float the line in in-active state. Active low, level sensitive. Should be de-bounced on the Module.	I OD CMOS	1.8V	PU 10K	
ETH_B_(R)(G)MII_CRS	D2							
ETH_B_(R)(G)MII_COL	E1							
ETH_B_(S)(R)(G)MII_TXD0	G1							
ETH_B_(S)(R)(G)MII_TXD1	F1							
ETH_B_(S)(R)(G)MII_TXD2	G2							
ETH_B_(S)(R)(G)MII_TXD3	F2							
ETH_B_(R)(G)MII_TX_EN(ER)	J2							
ETH_B_(R)(G)MII_TX_CLK	H1							
ETH_B_(S)(R)(G)MII_RXD0	J1							
ETH_B_(S)(R)(G)MII_RXD1	K1							
ETH_B_(R)(G)MII_RXD2	M1							
ETH_B_(R)(G)MII_RXD3	N1							
ETH_B_(R)(G)MII_RX_ER	K2							
ETH_B_(R)(G)MII_RX_DV(ER)	L1							
ETH_B_(R)(G)MII_RX_CLK	P1							

Contact Name OSM	Contact Acronym	CPU Contact	Signal Name	Functional Description	I/O Type	I/O Level	PU / PD	Comments
ETH_B_SDP	M2							
ETH_B_MDIO	C7							
ETH_B_MDC	C6							
GPIO_C_0	D3	NAND_DATA00	GPIO3_IO06	General purpose I/O Contact C0	I/O CMOS	V_OUT_IO		
GPIO_C_1	D4	NAND_DATA01	GPIO3_IO07	General purpose I/O Contact C1	I/O CMOS	V_OUT_IO		
GPIO_C_2	E3	NAND_DATA02	GPIO3_IO08	General purpose I/O Contact C2	I/O CMOS	V_OUT_IO		
GPIO_C_3	E4	NAND_DATA03	GPIO3_IO09	General purpose I/O Contact C3	I/O CMOS	V_OUT_IO		
GPIO_C_4	F3	NAND_CE0_B	GPIO3_IO01	General purpose I/O Contact C4	I/O CMOS	V_OUT_IO		
GPIO_C_5	F4	NAND_ALE	GPIO3_IO00	General purpose I/O Contact C5	I/O CMOS	V_OUT_IO		
GPIO_C_6	G3	SAI1_TXD7	GPIO4_IO19	General purpose I/O Contact C6	I/O CMOS	V_OUT_IO		
GPIO_C_7	G4	SAI1_RXFS	GPIO4_IO00	General purpose I/O Contact C7	I/O CMOS	V_OUT_IO		
DSI_DATA0_N	AB11	MIPI_DSI_D0_N	MIPI_DSI_D0_N	DSI differential output (point to point)	O LVDS D-PHY			
DSI_DATA0_P	AB10	MIPI_DSI_D0_P	MIPI_DSI_D0_P	DSI differential output (point to point)	O LVDS D-PHY			
DSI_DATA1_N	AC9	MIPI_DSI_D1_N	MIPI_DSI_D1_N	DSI differential output (point to point)	O LVDS D-PHY			
DSI_DATA1_P	AC8	MIPI_DSI_D1_P	MIPI_DSI_D1_P	DSI differential output (point to point)	O LVDS D-PHY			
DSI_DATA2_N	AC6	MIPI_DSI_D2_N	MIPI_DSI_D2_N	DSI differential output (point to point)	O LVDS D-PHY			
DSI_DATA2_P	AC5	MIPI_DSI_D2_P	MIPI_DSI_D2_P	DSI differential output (point to point)	O LVDS D-PHY			
DSI_DATA3_N	AB5	MIPI_DSI_D3_N	MIPI_DSI_D3_N	DSI differential output (point to point)	O LVDS D-PHY			
DSI_DATA3_P	AB4	MIPI_DSI_D3_P	MIPI_DSI_D3_P	DSI differential output (point to point)	O LVDS D-PHY			
DSI_CLOCK_N	AB8	MIPI_DSI_CLK_N	MIPI_DSI_CLK_N	DSI differential clock output (point to point)	O LVDS D-PHY			
DSI_CLOCK_P	AB7	MIPI_DSI_CLK_P	MIPI_DSI_CLK_P	DSI differential clock output (point to point)	O LVDS D-PHY			
DSI_TE	AA3							
CSI_DATA0_N	C1	MIPI_CSI_D0_N	MIPI_CSI_D0_N	CSI differential input (point to point)	I LVDS D-PHY / I LVDS M-PHY			
CSI_DATA0_P	B1	MIPI_CSI_D0_P	MIPI_CSI_D0_P	CSI differential input (point to point)	I LVDS D-PHY / I LVDS M-PHY			
CSI_DATA1_N	A2	MIPI_CSI_D1_N	MIPI_CSI_D1_N	CSI differential input (point to point)	I LVDS D-PHY / I LVDS M-PHY			
CSI_DATA1_P	A3	MIPI_CSI_D1_P	MIPI_CSI_D1_P	CSI differential input (point to point)	I LVDS D-PHY / I LVDS M-PHY			
CSI_DATA2_N	A5	MIPI_CSI_D2_N	MIPI_CSI_D2_N	CSI differential input (point to point)	I LVDS D-PHY / I LVDS M-PHY			
CSI_DATA2_P	A6	MIPI_CSI_D2_P	MIPI_CSI_D2_P	CSI differential input (point to point)	I LVDS D-PHY / I LVDS M-PHY			
CSI_DATA3_N	B6	MIPI_CSI_D3_N	MIPI_CSI_D3_N	CSI differential input (point to point)	I LVDS D-PHY / I LVDS M-PHY			
CSI_DATA3_P	B7	MIPI_CSI_D3_P	MIPI_CSI_D3_P	CSI differential input (point to point)	I LVDS D-PHY / I LVDS M-PHY			
CSI_CLOCK_N	B3	MIPI_CSI_CLK_N	MIPI_CSI_CLK_N	CSI differential clock input (point to point)	I LVDS D-PHY			
CSI_CLOCK_P	B4	MIPI_CSI_CLK_P	MIPI_CSI_CLK_P	CSI differential clock input (point to point)	I LVDS D-PHY			

Contact Name OSM	Contact Acronym	CPU Contact	Signal Name	Functional Description	I/O Type	I/O Level	PU / PD	Comments
CAM_MCK	C2	GPIO1_IO14	CCM_CLKO1	Master clock output	O CMOS	V_OUT_IO		
I2C_CAM_SDA / CSI_TX_N	C3	I2C4_SDA	I2C4_SDA	I2C data for serial camera data support link or differential data lane	I/O OD CMOS / O LVDS M-PHY	V_OUT_IO	PU 2.2K	
I2C_CAM_SCL / CSI_TX_P	C4	I2C4_SCL	I2C4_SCL	I2C clock for serial camera data support link or differential data lane	I/O OD CMOS / O LVDS M-PHY	V_OUT_IO	PU 2.2K	
RGB_R0	Y7							
RGB_R1	AA6							
RGB_R2	Y6							
RGB_R3	AA5							
RGB_R4	Y5							
RGB_R5	Y4							
RGB_G0	W4							
RGB_G1	V3							
RGB_G2	V4							
RGB_G3	U3							
RGB_G4	T3							
RGB_G5	T4							
RGB_B0	R4							
RGB_B1	R3							
RGB_B2	P3							
RGB_B3	N3							
RGB_B4	N4							
RGB_B5	M3							
RGB_(PIXEL)CLK	M4							
RGB_VSYNC	L3							
RGB_HSYNC	K3							
RGB_DISP	K4							
RGB_DE	J4							
RGB_RESET#	J3							
RGB_CS#	H3							
USB_C_D_N	D11							
USB_C_D_P	D10							
USB_C_ID	D9							
USB_C_OC#	C8							
USB_C_VBUS	C9							
USB_C_EN	C10							

Contact Name OSM	Contact Acronym	CPU Contact	Signal Name	Functional Description	I/O Type	I/O Level	PU / PD	Comments
USB_C_SSTX_N	A9							
USB_C_SSTX_P	A8							
USB_C_SSRX_N	B11							
USB_C_SSRX_P	B10							
PCle_A_HSI0_P	AB1	PCIE_RXN_P	PCIE_RXN_P	Differential PCIe link A receive data pair	I LVDS PCIE			AC coupled off module
PCle_A_HSI0_N	AB2	PCIE_RXN_N	PCIE_RXN_N	Differential PCIe link A receive data pair	I LVDS PCIE			AC coupled off module
PCle_A_HSO0_P	AC2	PCIE_TXN_P	PCIE_TXN_P	Differential PCIe link A transmit data pair	O LVDS PCIE			AC coupled off module
PCle_A_HSO0_N	AC3	PCIE_TXN_N	PCIE_TXN_N	Differential PCIe link A transmit data pair	O LVDS PCIE			AC coupled off module
PCle_CLKREQ#	W2	SAI5_RXD1	GPIO3_IO22	PCIe reference clock request	I OD CMOS	V_OUT_IO	PU 10k	This function is currently not available
PCle_A_PERST#	V2	SAI5_RXD2	GPIO3_IO23	PCIe Port A reset output	O CMOS	V_OUT_IO		
PCle_REFCLK_P	W1	PCIE_CLK_P	PCIE_CLK_P	Differential PCIe reference clock output	O LVDS PCIE			
PCle_REFCLK_N	Y1	PCIE_CLK_N	PCIE_CLK_N	Differential PCIe reference clock output	O LVDS PCIE			
PCle_WAKE#	T2	SAI5_RXD3	GPIO3_IO24	PCIe wake up interrupt to host – common to PCIe links A, B, C, D	I OD CMOS	V_OUT_IO	PU 10k	
PCle_SMDAT	U1	I2C4_SDA	I2C4_SDA	System management I2C bus DATA	I/O OD CMOS	V_OUT_IO	PU 2k2	shared with I2C_CAM_SDA
PCle_SMCLK	T1	I2C4_SCL	I2C4_SCL	System management I2C bus CLK	O OD CMOS	V_OUT_IO	PU 2k2	shared with I2C_CAM_SDA
PCle_SM_ALERT#	R2	SAI3_RXFS	GPIO4_IO28	SMBus Alert# (interrupt) signal	I OD CMOS	V_OUT_IO	PU 10k	
RESERVED	N2, AA2							
Vendor Defined	D6	CLKOUT1	CLKOUT1	Defined by module manufacturer				
Vendor Defined	D7	CLKOUT2	CLKOUT2	Defined by module manufacturer				

Table 7: Pinout of OSM-S i.MX8M Mini

9.3 KED specific Pins

There are no KED specific pins on this SoM, however, observe the keep out area from chapter 8.5 Module Layout and Components.

10 Implementation

10.1 Power Control

10.1.1 Power Supply

The SoM can be powered from a single 5V power source at VCC_IN_5V pins. If the RTC is used RTC_PWR also needs to be powered. OSM pins VCC_IN_3V3 and V_BAT are not used.

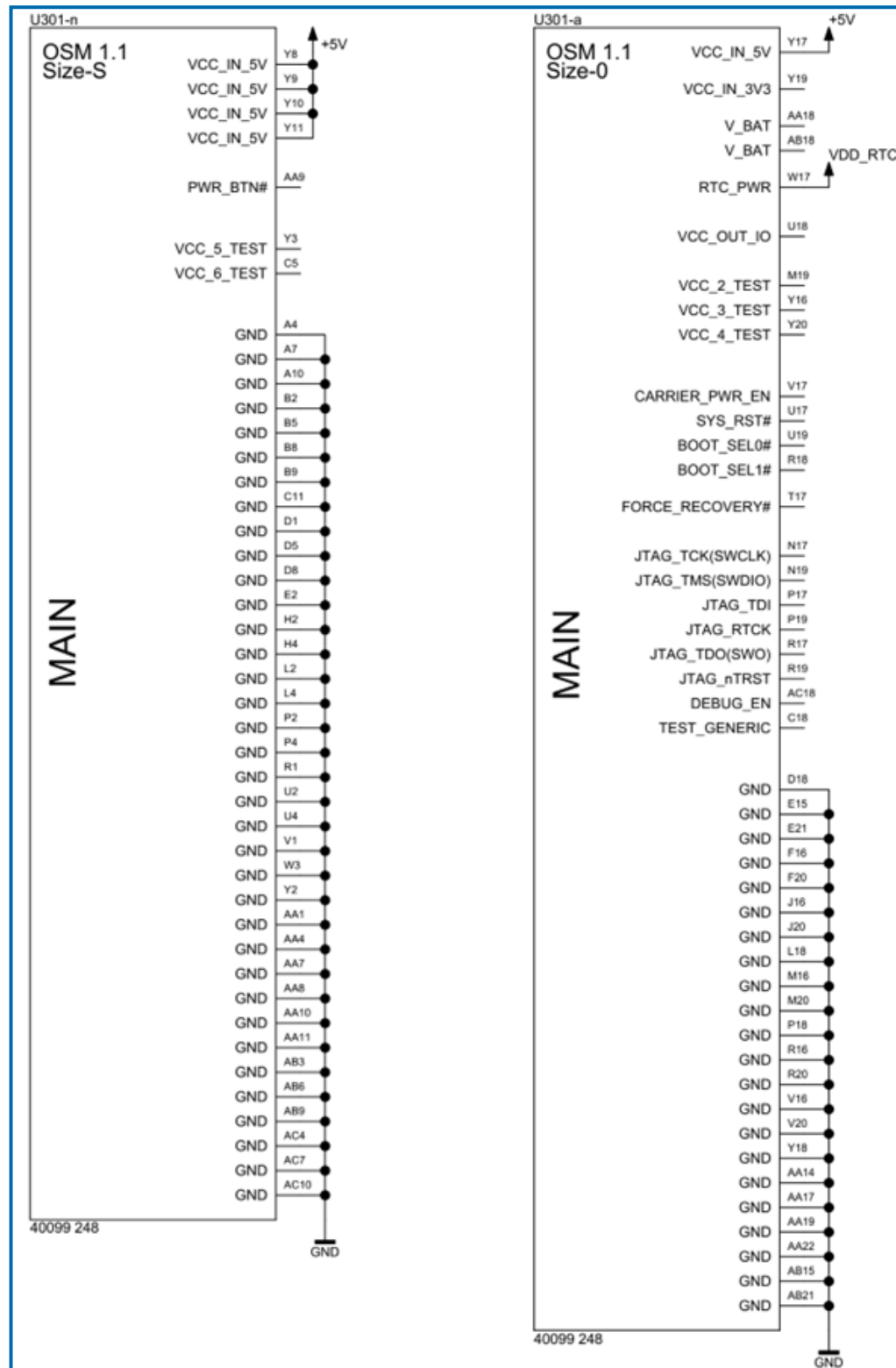


Figure 8: Power Supply Scheme



Information

The following parameters must be provided by the carrier board:

- Operating Voltage Ripple Limits:
The voltage ripple (peak-to-peak) in the frequency range from 0 to 20 MHz must not exceed 100 mV.
- Startup Voltage Rise Time Requirement:
The rise time up to 10 % of the nominal VCC must be within the range of 0.1 ms to 20 ms.

10.1.2 Supply Voltage

Table 9: Supply Voltage

Voltage	nominal	min	max
VCC_IN_5V	5.0	4.5	5.5
RTC_PWR	3.0	1.1	5.5

10.1.3 Supply Current

The supply current is measured on the SoM using the following commands:

Stresstest on all 4 CPUs:

```
stress-ng --matrix 0 -t 0
```

Stresstest on all 4 CPUs and RAM:

```
stress-ng --matrix 0 -t 0 --vm 4 --vm-bytes 50%
```

Table 10: Supply Current VCC_IN_5V

Use case	typ
Linux booted, idle	160 mA
Stress test on 4x CPU	360 mA
Stress test on 4xCPU and RAM	430 mA

The current of the RTC is measured with VCC_IN_5V supplied with +5V and while power off. RTC_PWR is supplied with +3.0V.

Table 11: RTC_PWR Current

Use Case	typ
Power on	0 nA
Power off	50 nA

10.1.4 Output Voltage

The SoM has some power output pins that can be used on the baseboard. The voltage test pins VCC_6_TEST (C5) and VCC_5_TEST (Y3) can also be used, all other VCC_X_TEST pins should not be used.

Table 12: Output Current

Pin	Nom Voltage	Max Current
VCC_5_TEST	+3.3 V	500 mA
VCC_6_TEST	+1.8 V	500 mA
VCC_OUT_IO / SDIO_B_IOPWR	+1.8 V / +3.3 V	500 mA
NVCC_SD	+1.8 V / +3.3 V	100 mA



NOTICE

There is no current limiting device for the voltage outputs. Drawing too much current may damage the device and/or lead to malfunction.

10.1.5 IO Voltage

As defined by the OSM standard, the IO voltage of the most pins is +1.8V by default (except size-0). As many systems still may run with +3.3V Kontrons OSM SoM offers the possibility to switch IO voltage to +3.3V by pulling vendor defined pin B22 to GND. This voltage is also output on VCC_OUT_IO.



Information

Use Table 7 to see which pin is supplied by VCC_OUT_IO and is therefore switchable from +1.8V to +3.3V

10.2 Reset Pin

A low level at SYS_RST# triggers a reset. The module will stay in reset as long as SYS_RST# is grounded. Connect an open drain output or ground switch to SYS_RST#. If unused, leave this pin floating. No external components are required.



NOTICE

SYS_RST# is connected to PMIC_RST_B of the PMIC. Once it is asserted low, PMIC performs cold reset. All voltage regulators are recycled. This also effects output voltage of the SoM.

10.3 Boot Mode

The BOOT_SELx# pins are currently not supported by software. Leaving both pins floating sets the module to default boot medium.

For selecting the boot medium the FORCE_RECOVERY# pin is also involved. In case the bootloader is invalid, and the module won't boot any more, this pin can be used to sent the CPU into recovery mode.

The fuses are set during production and define the boot medium for default boot

Table 13: FORCE_RECOVERY# Pin Settings

FORCE_RECOVERY#	Boot Type
float	boot from fuses
GND	recovery boot

In recovery mode, the SoM is configured to boot from SD Card on SD2. If no valid image is found on SD2, the CPU switches to Serial Downloader.

10.4 SD/MMC Manufacture Mode

If no valid boot image is found on the programmed boot devices the SoM switches to SD/MMC manufacture mode before the serial download mode. In the manufacture mode, one-bit bus width is used on uSDHC2 interface to load a boot image from SD card.



Hints and Tips

It is recommended to have the SDIO_A (uSDHC2) available on the baseboard to boot from SD-card during development.

10.5 Serial Downloader

The Serial Downloader provides a means to download a program image to the chip over the USB OTG1 serial connection. The ID pin is ignored in serial downloader mode.



Hints and Tips

It is recommended to have the OTG1 pins available on the baseboard to recover the SoM in case of a broken image. FORCE_RECOVERY# pin should also be accessible for this purpose.

10.6 SD Card

The i.MX8M Mini has three uSDHC interfaces that are compliant to SD/SDIO 3.0 with 200 MHz SDR signalling to support up to 100 MB/sec. uSDHC1 is internally connected to the eMMC. uSDHC2/3 are available on OSM Pins SDIO_A/B.

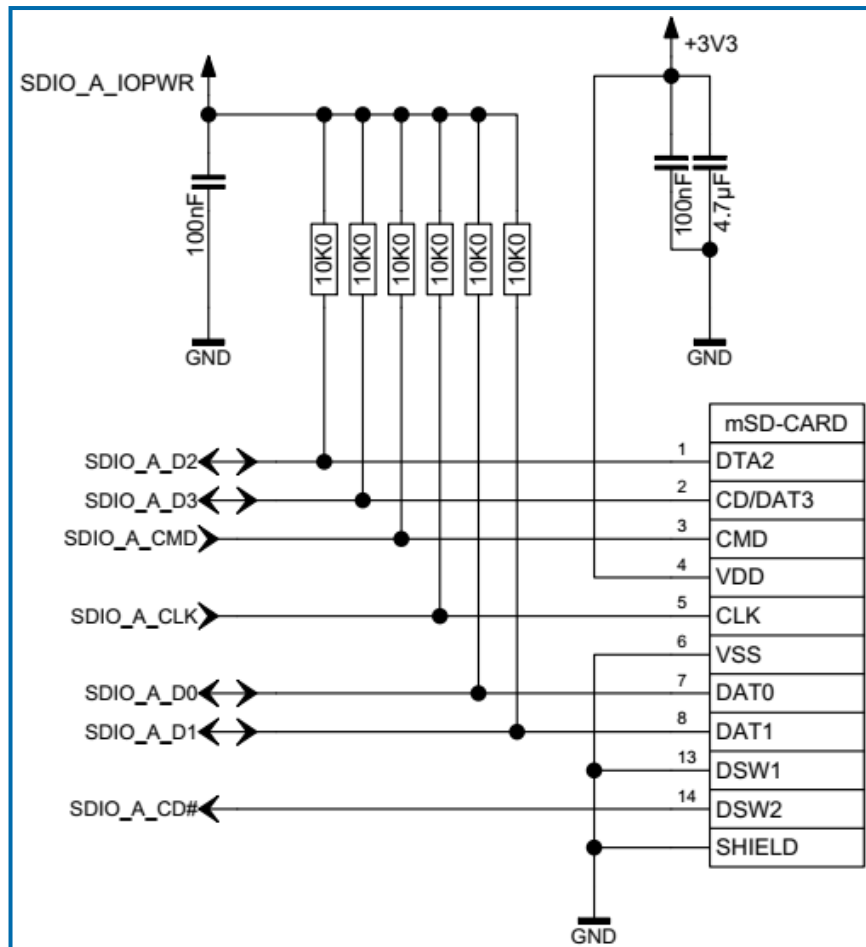


Figure 9: SD-Card Connection Example



Information

If UHS-I mode is required uSDHC2 should be used as this interface is powered from a dedicated LDO and the supply can be switched from +3.3 V to +1.8 V. This supply voltage NVCC_SD is accessible on SDIO_A_IOPWR to connect external pull-ups.

10.7 Linux Console

The Linux console is one of the most important tools to access the SoM. The console can be used to send commands to the SoM and receive information from the SoM.



Hints and Tips

It is recommended to have the console pins UART_CON available on the baseboard.

11 Soldering



NOTICE

- There should be no open vias under the SoM on the baseboard, as this poses a risk of short circuits. Therefore, the vias under the SoM should be plugged.
- To minimize stress for the components, it is strongly recommended to solder the SoM during the last reflow cycle of the carrier board manufacturing process.
- We recommend the soldering process with the parameters in the table and the diagram below.

Table 14: Reflow Profile

Profile Feature	Pb-Free Assembly
Average Ramp-Up Rate (T _S MAX to T)	3°C/second max.
Preheat	
Temperature Min (T _S MIN)	150 °C
Temperature Max (T _S MAX)	200 °C
Time (t _s) from (T _S MIN to T _S MAX)	60-120 seconds
Liquidous temperature (T _L)	217 °C
Time (t _L) maintained above T _L	60-80 seconds
Peak/Classification Temperature (T _P)	250 °C
Peak/Classification Temperature (t _p)	20 seconds
Ramp-down rate	6 °C / second max
Time 25 °C to peak temperature	8 minutes max

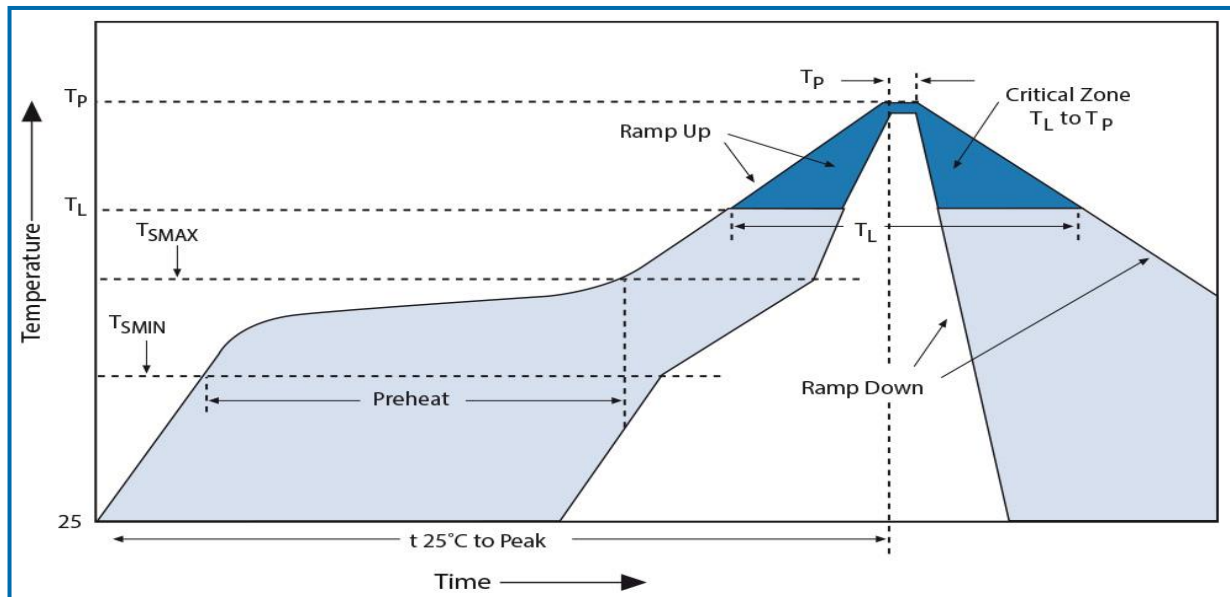


Figure 10: Reflow Classification Profile

12 Storage, Transportation and Maintenance

12.1 Storage

If the product is not in use for an extended period time, disconnect the power plug from the AC outlet. If it is necessary to store the product then re-pack the product as originally delivered to avoid damage. The storage facility must meet the products environmental requirements as stated within this user guide. Kontron Electronics recommends keeping the original packaging material for future storage or warranty shipments.

12.2 Transportation

To ship the product, use the original packaging, designed to withstand impact and adequately protect the product. When packing or unpacking products always take shock and ESD protection into consideration and use an EOS/ESD safe working area.

12.3 Maintenance

Maintenance or repair on the product may only be carried out by qualified personnel authorized by Kontron Electronics.



NOTICE

Do not use steel wool, metallic threads or solvents like abrasives, alcohol, acetone or benzene for cleaning the OSM-S i.MX8M Mini.



WARNING

Keep the OSM-S i.MX8M Mini dry. Exposure to water may cause damage to the device and pose a risk to the user.

13 Technical Support

13.1 First Steps – Startup Information

For the first startup the OSM-S i.MX8M Mini you will find more information and known issues about the Software / BSP (demo) and additional hardware information at the online documentation.

Please follow the link: <https://docs.kontron-electronics.de/sw/ked/docs/docs/>

The online documentation is primarily intended for our Development Kit but will help you also to put your OSM-S i.MX8M Mini into operation. Additionally, you will find information how to get access to the Yocto based GitLab software repository and how to make your own software images.

Extended Support

For detailed technical support please contact:

E-Mail: support@kontron-electronics.de

Make sure you have the following product identification information in your e-mail:

- Product name
- Product model number
- Serial number (SN) of the unit

Please explain the nature of your problem in your e-mail.



Serial Number

The serial number can be found on the label on the system.

13.2 License Information

The demo software contained in the device (BSP) contains parts which were licensed as free respectively open-source software under the GNU General Public License, version 2 and/or 3, respectively the GNU Lesser General Public License, versions 2.1 and/or 3.0.

You can obtain a pre-configured demo image at <https://docs.kontron-electronics.de/> or contact:

Kontron Electronics GmbH
Max-Planck-Str. 6
72636 Frickenhausen
Germany

Web: www.kontron-electronics.com

E-Mail: support@kontron-electronics.de

14 Product Usage Life Cycle

14.1 Warranty

Kontron Electronics defines product warranty in accordance with regional warranty definitions. Claims are at Kontron Electronics discretion and limited to the defect being of a material nature. To find out more about the warranty conditions and the defined warranty period for your region, following the steps below:

1. Visit Kontron Electronics Term and Conditions webpage

www.kontron-electronics.com/downloads/

2. Click on the relevant document

Limitation/Exemption from Warranty Obligation

In general, Kontron Electronics shall not be required to honor the warranty, even during the warranty period, and shall be exempted from the statutory accident liability obligations in the event of damage caused to the product due to failure to observe the following:

- Safety instructions for within this user guide
- Warning labels on the product and warning symbols within this user guide
- Information and hints within this user guide

Additionally, alterations or modifications to the product that are not explicitly approved by Kontron Electronics, described in this user guide, or received from Kontron Electronics Support as a special handling instruction will void your warranty.

Within the warranty period, the product should only be opened by Kontron Electronics. Removing the protection label and opening the product within the warranty period exempts the product from the statutory warranty obligation.

Due to their limited service life, parts which by their nature are subject to a particularly high degree of wear (wearing parts) are excluded from the warranty beyond that provided by law.

14.2 Quality and Environmental Management

Kontron Electronics aims to deliver reliable high-end products designed and built for quality, and aims to complying with environmental laws, regulations, and other environmentally oriented requirements. For more information regarding Kontron Electronics' quality and environmental responsibilities, visit www.kontron-electronics.com/company/about-us/germany/

14.3 Disposal and Recycling

Kontron Electronics' products are manufactured to satisfy environmental protection requirements where possible. Many of the components used are capable of being recycled. Final disposal of this product after its service life must be accomplished in accordance with applicable country, state, or local laws or regulations.

14.4 WEEE Compliance

The Waste Electrical and Electronic Equipment (WEEE) Directive aims to:

- Reduce waste arising from electrical and electronic equipment (EEE).
- Make producers of EEE responsible for the environmental impact of their products, especially when the product becomes waste.
- Encourage separate collection and subsequent treatment, reuse, recovery, recycling and sound environmental disposal of EEE.
- Improve the environmental performance of all those involved during the lifecycle of EEE.



Environmental Protection

Environmental protection is a high priority with Kontron Electronics.
Kontron Electronics follows the WEEE directive.
You are encouraged to return our products for proper disposal.

15 Appendix

List of Acronyms

Table 15: List of Acronyms

Acronym	Description	Acronym	Description
AC	Alternating Current	HD/HDD	Hard Disk /Drive
AIN	Analog Input	HDMI	High-Definition Multimedia Interface
AL	Automation Line (Board with housing)	HPM	PICMG Hardware Platform Management specification family
BL	Board Line (Board without housing)	H/W	Hardware
BSP	Board Support Package (Software)	IEC	International Electrotechnical Commission (Standards)
CAN	Controller Area Network (BUS)	IOL	IPMI-Over-LAN
CPI	Advanced Configuration Control Interface	IOT	Internet of Things
CPU	Central Processing Unit	KVM	Keyboard Video Mouse
CSI	Camera Serial Interface	LAN	Local Area Network
DC	Direct Current	LED	Light Emitting Device / Diode
DIN	Deutsches Institut für Normung, German Institute for Standardization (Standards)	LPDDR	Low-Power Double Data Rate (RAM)
DIO	Digital Input/Output	LVD	Low Voltage Device
DK	Development Kit	M.2	Next smaller generation of mSATA
DL	Display Line (Board with Display)	MEI	Management Engine Interface
DOUT	Digital Output	mPCIe	Mini PCI-Express
DP	Display Port	mSATA	Mini SATA
DSI	Display Serial Interface	OS	Operating System
ECC	Error Checking and Correction	PCIe	PCI-Express
EEE	Electrical and Electronic Equipment	RAM	Read Access Memory
EHCI	Enhanced Host Controller Interface	REV	Revision
EMC	Electromagnetic Compatibility	RoHS	Restriction of the use of certain hazardous substances
eMMC	Embedded MultiMediaCard	ROM	Read-only memory
EN	European Norm (Standards)	RTC	Real Time Clock
ESD	Electrostatic Discharge	SATA	Serial-ATA
ETH	Ethernet (LAN)	SEL	System Event Log
GbE	Gigabit Ethernet	SELV	Safety Extra Low Voltage
GPIO	General-Purpose Input/Output	SIO	Super Input/output

Acronym	Description	Acronym	Description
GPU	Graphics Processing Unit	SMBus	System Management Bus
SMWI	System Monitor Web Interface	USB	Universal Serial Bus
SN	Serial Number	USB OTG	USB On-The-Go (Host)
SOL	Serial Over LAN	uSD	microSD (Memory Card)
SSD	Solid State Drive	VGA	Video Graphics Array
TPM	Trusted Platform Module	VLP	Very Low Profile
UEFI	Unified Extensible Firmware Interface	WEEE	Waste Electrical and Electronic Equipment
uHDMI	Micro-HDMI	WLAN	Wireless LAN
UL	Underwriters Laboratories (Standards)	XHCI	eXtensible Host Controller Interface

"List of Acronyms"



About Kontron

Kontron AG is a leading IoT technology company. For more than 20 years, Kontron has been supporting companies from a wide range of industries to achieve their business goals with intelligent solutions. From automated industrial operations, smarter and safer transport to advanced communications, connectivity, medical, and energy solutions, the company delivers technologies that add value for its customers. With the acquisition of Katek SE in early 2024, Kontron significantly strengthens its portfolio with the new GreenTec division, focusing on solar energy and eMobility, and grows to around 8,000 employees in over 20 countries worldwide. Kontron is listed on the SDAX® and TecDAX® of the German Stock Exchange.

For more information, please visit: www.kontron.com

About Kontron Electronics

Kontron Electronics GmbH is a full-service provider in the field of electronics, development and manufacturing services. Our business portfolio includes proprietary and client-specific products, development and design services for complex electronics components, modules and systems, as well as production and assembly services for entire devices. The company is part of the technology corporation Kontron AG.

For more information, please visit: www.kontron-electronics.com

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