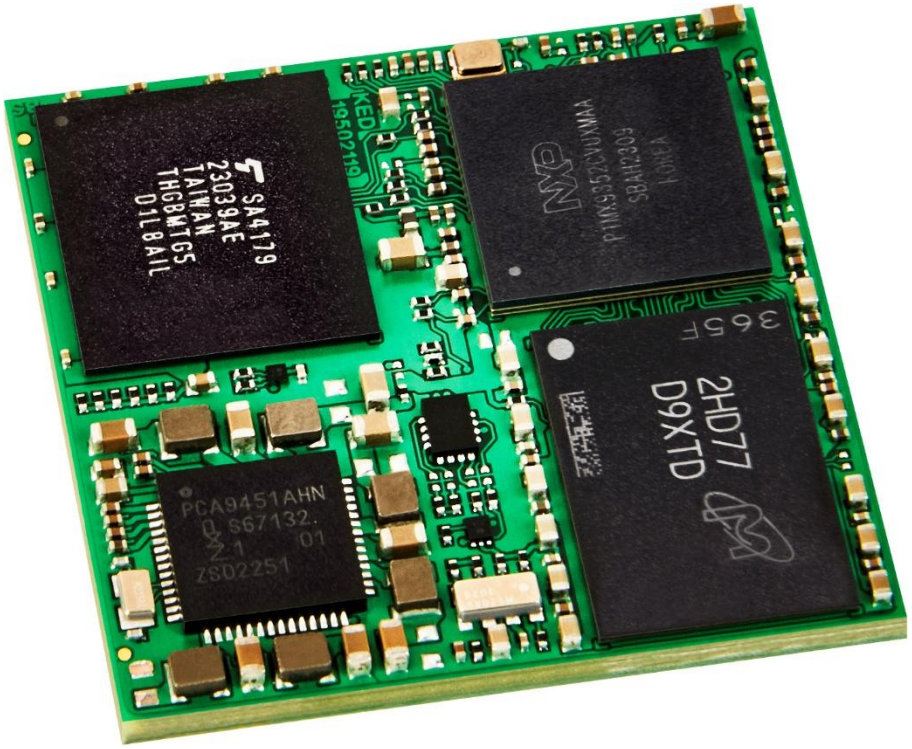

OSM-S i.MX93 DC

Doc. Rev 1.0

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Revision History

Table 1: Revision History

Revision	Brief Description of Changes	Date of Issue	Author/Editor
Rev. 0.1	Initial version	2024-07-03	Gb
Rev. 0.2	Updated Pintable	2024-09-25	Gb
Rev. 0.3	Updated Pintable	2024-12-04	Gb
Rev. 0.9	Pre-Release	2025-04-11	We
Rev. 1.0	Final Release	2025-05-14	We

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For contact information, refer to the corporate offices contact information on the last page of this user guide or visit our website CONTACT US.

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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.

Table of Contents

1 List of Tables

2 List of Figures

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.MX93 DC
- 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.MX93 DC.

The Advanced RISC Machines (ARM) based module is equipped with NXP i.MX93 processor. The dual 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.MX93 DC
Before working with the OSM-S i.MX93 DC, Kontron Electronics recommends that users take a few minutes to learn about the various parts of the OSM-S i.MX93 DC.

7 Product Overview

The OSM-S i.MX93 DC is a very small System-on-Module (SoM) using NXPs OSM-S i.MX93 DC processor with ARM Dual Cortex A55 and Cortex M4. The OSM-S i.MX93 DC 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. 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.MX93 DC as a baseboard with soldered-on OSM-S i.MX93 DC.

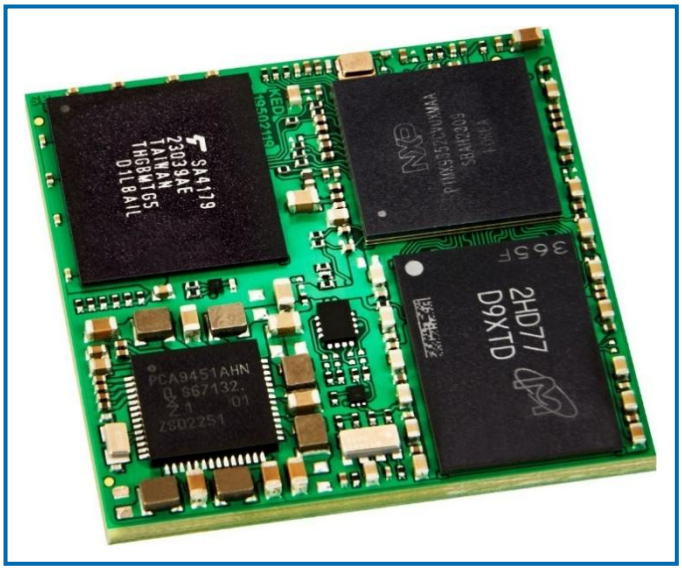

Figure 1: 30x30mm SoM with LGA Package

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 OSM modules 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.MX93 DC are:

- CPU from NXP i.MX93
- 2 x Arm® Cortex-A55 @1.7 GHz and 1 x Arm® Cortex®-M33 @250 MHz
- 1 GB or 2 GB LPDDR4 RAM
- 4GB up to 64GB eMMC memory
- 2x Gbit Ethernet
- Arm® Ethos™ U-65 microNPU
- Form factor 30 mm x 30 mm, OSM-Size S

7.2 Product Variants

Table 2: Product Variants of OSM-S i.MX93 DC

SoM	Description	Product Number
OSM-S i.MX93 DC 1GB/4GB -25...+85°C	SoM with NXP i.MX93 dual core processor, 1 GB LPDDR4 and 4 GB eMMC	40099 294
OSM-S i.MX93 DC 2GB/32GB -25...+85°C	SoM with NXP i.MX93 dual core processor, 2 GB LPDDR4 and 32 GB eMMC	40099 300
Other systems on request		

7.3 Related Products

The following products are available with the OSM-S i.MX93 DC:

- BL i.MX93 DC (Board Line, including soldered-on OSM-S i.MX93 DC)
- DK i.MX93 DC (Development Kit, including BL i.MX93 DC)
- Other systems on request

Table 3: Related Products of OSM-S i.MX93 DC

Product	Description	Product Number
BL OSM-S i.MX93 DC 2GB/32GB	Board Line with OSM-S i.MX93 SoM, 2 GB LPDDR4 and 32 GB eMMC	40099 312
DK i.MX93 DC 2GB/32GB	Development Kit with BL OSM-S i.MX93 DC 2GB/32GB, Power Supply, Connector Kit, USB Cable and Debug Adapter	50099 092
DK 7" i.MX93 DC 2GB/32GB	Development Kit with BL OSM-S i.MX93 DC 2GB/32GB, 7" Touch Display, Power Supply, Connector Kit, USB Cable and Debug Adapter	50099 093
Other systems on request		

8 System Specifications

8.1 Component Main Data

The table below summarizes the features of OSM-S i.MX93 DC.

Table 4: Component Main Data

OSM-S i.MX93 DC	
Form factor	30 x 30 mm with 332 + 84 LGA pads
Processor	NXP's MIMX9352CVVXMAB with 11mm x 11mm BGA package in 0.5mm pitch (industrial version) up to 1.7 GHz
Memory	3.7GT/s 16-bit LPDDR4x 1 GByte: 1x 8 Gbit density 512 M x16 LPDDR4 parts 2 GByte: 1x 16 Gbit density 1024 M x16 LPDDR4 parts
Stronge (eMMC 5.1 Flash)	up to 64 GB connected on SD1
EEPROM	8kB EEPROM on I2C1
Power Management	PCA9451AHN from NXP
Default Interfaces	
LAN	2x Gigabit Ethernet IEEE 1588 (1x with TSN)
USB	2x USB 2.0 (Host or Device)
Display	1x MIPI DSI (4-lane) – up to 1920 x 1200 @60fps 1x LVDS (4-lane) - up to 1366 x 768 @60fps
Camera	1x MIPI CSI (2-lane)
SD-Card	2x SDIO (4bit)
UART	4x (1x console, 3x general purpose)
GPIO	11x GPIO
I2C	2x general purpose
PWM	3x
CAN	2x CAN FD
SPI	2x
Audio	1x SAI (I2S)
ADC	4x 12-bit
Other Features	
RTC	1x RV-3028-C7 on I2C1, 45 nA @ 3 V, factory calibrated to ±1 ppm @ 25°C
Power	
Consumption	<1,5W…<3,5W
Input Voltage	Single Supply 5V ±5%
Software	
Operating System Support	Linux Yocto

NOTICE
Performing a forced shutdown can lead to loss of data!

8.2 Environmental Conditions

Table 5: Environmental Conditions

Operating	industrial: -25°C to 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.MX93 DC is designed for operation in a customer-specific enclosure or device. Please do not operate the OSM-S i.MX93 DC 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

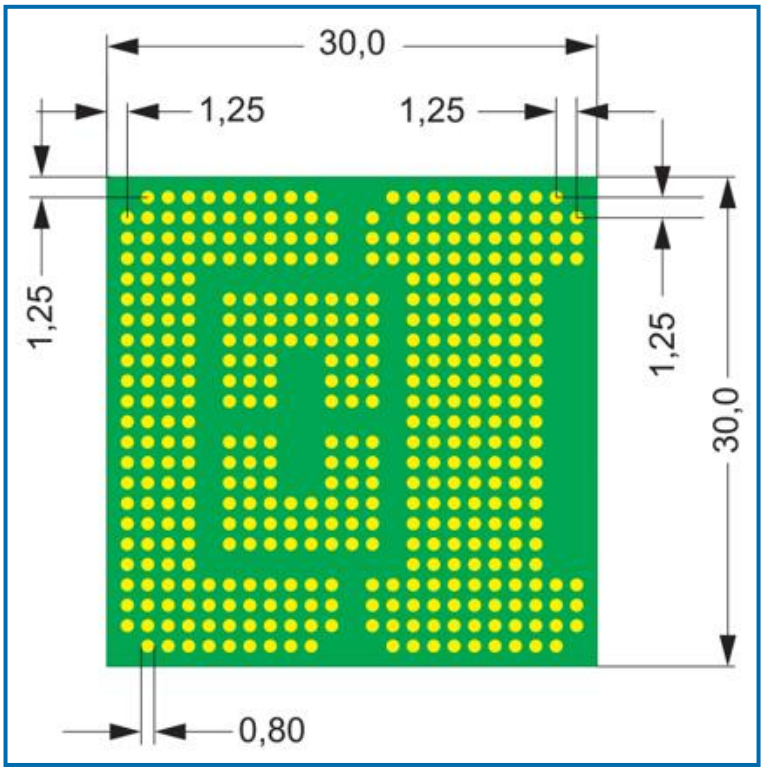

Figure 2: Dimensions of OSM S.i.MX93 (top side view)

Table 6: Mechanical Dimensions

Dimension	Description
Size	30mm x 30mm
PCB Thickness	1,5mm ± 0,1mm
Total height	2,5mm ± 0,1mm
Weight	TBD

8.4 Functional Block Diagram

The block diagram shows a detailed structure of the OSM-S i.MX93 DC module.

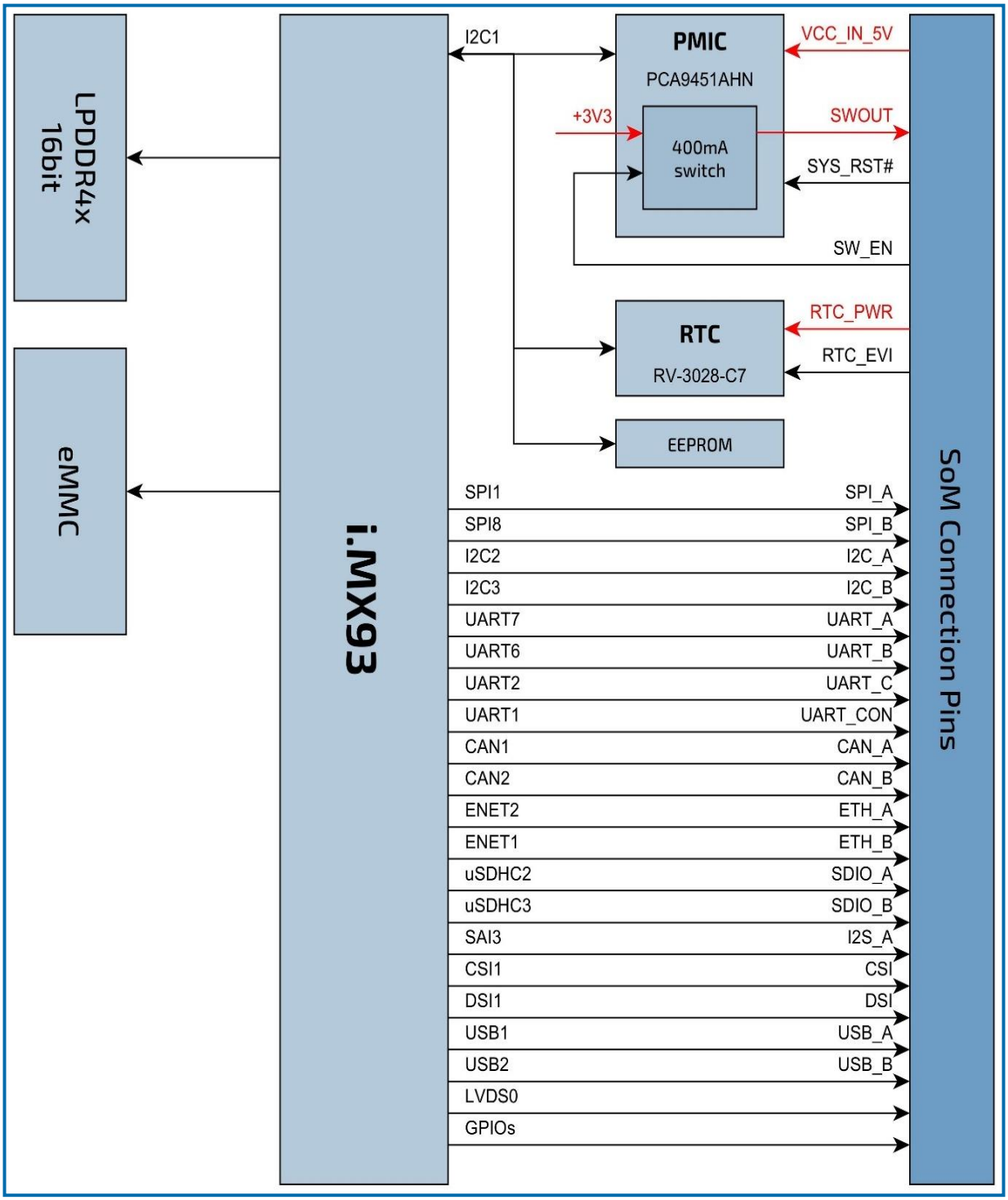

Figure 3: Block Diagram

8.5 Module Layout and Components

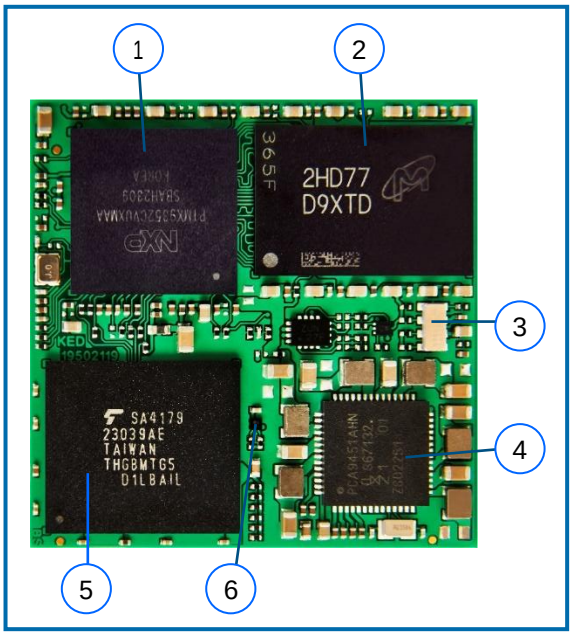

Figure 4: Top Side View

Number	Object
1	CPU
2	LPDDR4
3	RTC
4	PMIC
5	eMMC
6	EEPROM

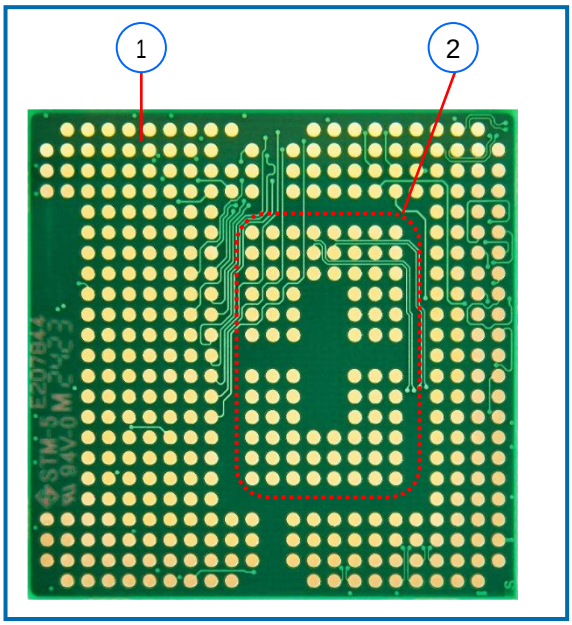

Figure 5: Bottom Side View

Number	Pins
1	OSM pads
2	KED feature pads

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.MX93 DC is designed for operation in a customer-specific enclosure or device. Please do not operate the OSM-S i.MX93 DC 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.MX93 DC 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

9 Pinout

9.1 Pinout Diagram

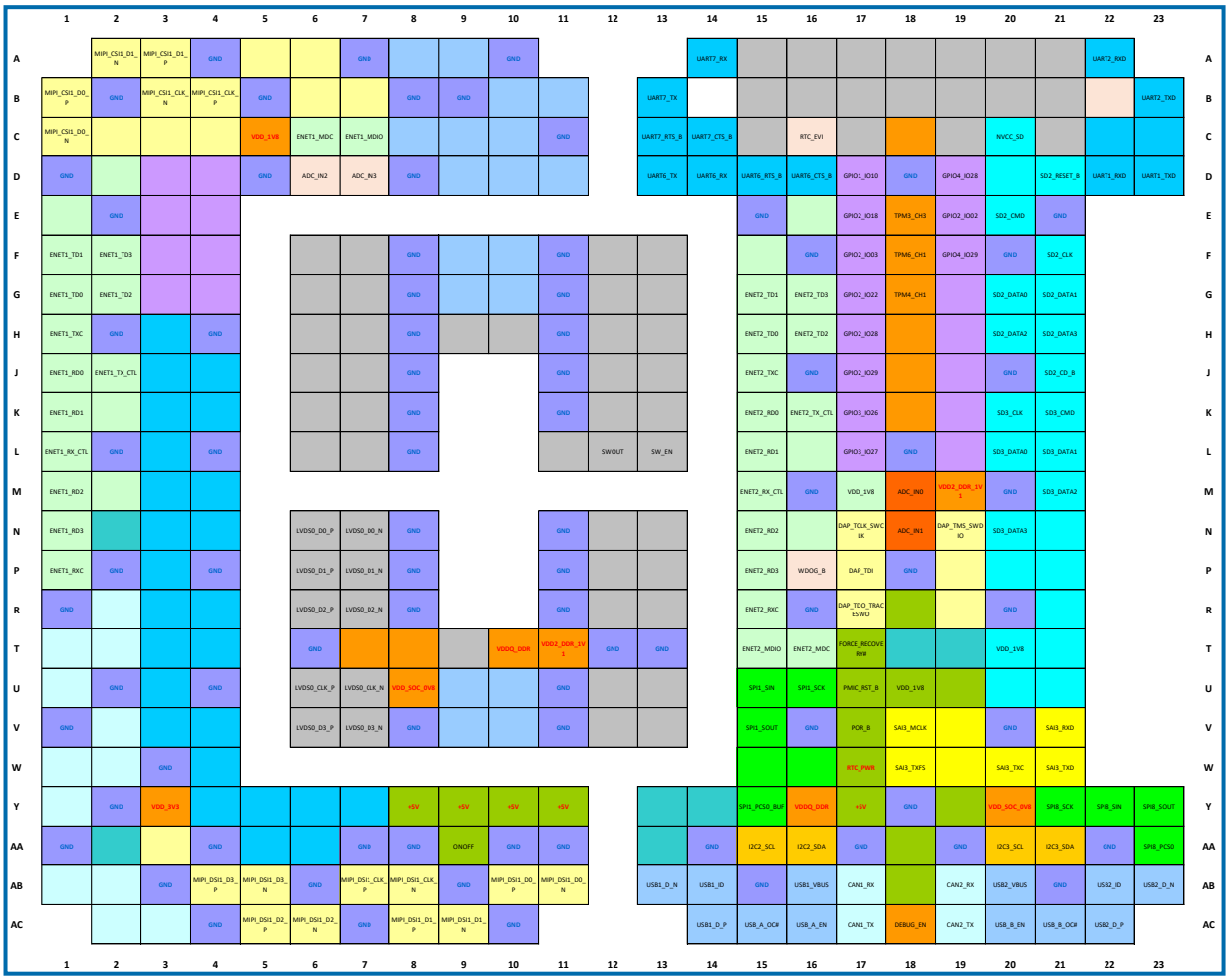

Figure 6: Pin Assignment (top view)

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.MX93 DC

Contact Name OSM	Contact Acronym	CPU Contact	Signal Name	Functional Description	I/O Type	I/O Level	PU / PD	Comments
VCC_2_TEST	M19		VDD2_DDR_1V1	Module power voltage testpoint	P			for testing only
VCC_3_TEST	Y16		VDDQ_DDR	Module power voltage testpoint	P			for testing only
VCC_4_TEST	Y20		VDD_SOC_0V8	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	Module Signal and power return and GND reference	P			

Contact Name OSM	Contact Acronym	CPU Contact	Signal Name	Functional Description	I/O Type	I/O Level	PU / PD	Comments
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 10K	
CARRIER_PWR_EN	V17		POR_B	Carrier board circuits should not be powered up until the module asserts the CARRIER_PWR_EN signal	O CMOS	1.8V		
VCC_OUT_IO	U18		VDD_1V8	Provides IO voltage level for several interfaces to connect	P	1.8V		IO Power Output. 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			
BOOT_SEL0#	U19							
BOOT_SEL1#	R18							
FORCE_RECOVERY#	T17		FORCE_RECOVERY#	If low on carrier board module enters recovery mode.	I OD CMOS	1.8V	PU 10k	floating: normal operation low: recovery mode sdcard / serial loader
JTAG_TCK(SWCLK)	N17	DAP_TCLK_SWCLK	DAP_TCLK_SWCLK	Test Clock	I CMOS	1.8V		
JTAG_TMS(SWDIO)	N19	DAP_TMS_SWDIO	DAP_TMS_SWDIO	Test Mode Select	I CMOS	1.8V		
JTAG_TDI	P17	DAP_TDI	DAP_TDI	Test Data Input	I CMOS	1.8V		
JTAG_RTCK	P19							
JTAG_TDO(SWO)	R17	DAP_TDO_TRACESWO	DAP_TDO_TRACESWO	Test Data Output	O CMOS	1.8V		
JTAG_nTRST	R19							
DEBUG_EN	AC18		DEBUG_EN	Enables JTAG function	I CMOS	1.8V		float: normal operation (Single Boot) low: Low Power Boot (M33 only)

Contact Name OSM	Contact Acronym	CPU Contact	Signal Name	Functional Description	I/O Type	I/O Level	PU / PD	Comments
TEST_GENERIC	C18							high: enables boundary scan float: normal operation
UART_A_RX	A14	GPIO_IO09	UART7_RX	Asynchronous serial data input port A	I CMOS	1.8V		
UART_A_TX	B13	GPIO_IO08	UART7_TX	Asynchronous serial data output port A	O CMOS	1.8V		
UART_A_RTS	C13	GPIO_IO11	UART7_RTS_B	"Request to Send" handshake line for port A	O CMOS	1.8V		
UART_A_CTS	C14	GPIO_IO10	UART7_CTS_B	"Clear to Send" handshake line for port A	I CMOS	1.8V		
UART_B_RX	D14	GPIO_IO05	UART6_RX	Asynchronous serial data input port B	I CMOS	1.8V		
UART_B_TX	D13	GPIO_IO04	UART6_TX	Asynchronous serial data output port B	O CMOS	1.8V		
UART_B_RTS	D15	GPIO_IO07	UART6_RTS_B	"Request to Send" handshake line for port B	O CMOS	1.8V		
UART_B_CTS	D16	GPIO_IO06	UART6_CTS_B	"Clear to Send" handshake line for port B	I CMOS	1.8V		
UART_C_RX	A22	UART2_RXD	UART2_RXD	Asynchronous serial data input port C	I CMOS	1.8V		
UART_C_TX	B23	UART2_TXD	UART2_TXD	Asynchronous serial data output port C	O CMOS	1.8V		no external pull resistors allowed. BOOT_MODE1
UART_D_RX	C22							
UART_D_TX	C23							
UART_CON_RX	D22	UART1_RXD	UART1_RXD	Asynchronous serial data input port console	I CMOS	1.8V		
UART_CON_TX	D23	UART1_TXD	UART1_TXD	Asynchronous serial data output port console	O CMOS	1.8V		no external pull resistors allowed. BOOT_MODE0
ETH_A_(R)(G)MII_CRS	E16							
ETH_A_(R)(G)MII_COL	F15							

Contact Name OSM	Contact Acronym	CPU Contact	Signal Name	Functional Description	I/O Type	I/O Level	PU / PD	Comments
ETH_A_(S)(R)(G)MII_TXD0	H15	ENET2_TD0	ENET2_TD0	Transmit data bit 0 (transmitted first) port A	O CMOS	1.8V		
ETH_A_(S)(R)(G)MII_TXD1	G15	ENET2_TD1	ENET2_TD1	Transmit data bit 1 port A	O CMOS	1.8V		
ETH_A_(S)(R)(G)MII_TXD2	H16	ENET2_TD2	ENET2_TD2	Transmit data bit 2 port A	O CMOS	1.8V		
ETH_A_(S)(R)(G)MII_TXD3	G16	ENET2_TD3	ENET2_TD3	Transmit data bit 3 port A	O CMOS	1.8V		
ETH_A_(R)(G)MII_TX_EN(_ER)	**K16**	**ENET2_TX_CTL**	**ENET2_TX_CTL**	**Transmit enable (Error) port A**	**O CMOS**	**1.8V**		
ETH_A_(R)(G)MII_TX_CLK	J15	ENET2_TXC	ENET2_TXC	Transmit clock port A	I/O CMOS	1.8V		
ETH_A_(S)(R)(G)MII_RXD0	K15	ENET2_RD0	ENET2_RD0	Receive data bit 0 (received first) port A	I CMOS	1.8V		
ETH_A_(S)(R)(G)MII_RXD1	L15	ENET2_RD1	ENET2_RD1	Receive data bit 1 port A	I CMOS	1.8V		
ETH_A_(R)(G)MII_RXD2	N15	ENET2_RD2	ENET2_RD2	Receive data bit 2 port A	I CMOS	1.8V		
ETH_A_(R)(G)MII_RXD3	P15	ENET2_RD3	ENET2_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	ENET2_RX_CTL	ENET2_RX_CTL	Receive data valid port A	I CMOS	1.8V		
ETH_A_(R)(G)MII_RX_CLK	R15	ENET2_RXC	ENET2_RXC	Receive clock port A	I/O CMOS	1.8V		
ETH_A_SDP	N16							
ETH_MDIO	T15	ENET2_MDIO	ENET2_MDIO	Management bus data signal for Ethernet	I/O CMOS	1.8V		
ETH_MDC	T16	ENET2_MDC	ENET2_MDC	Management bus clock signal for Ethernet	O CMOS	1.8V		
ETH_IOPWR	M17		VDD_1V8	ETH voltage. It is used to provide the IO Voltage Level for all Ethernet interfaces.	P	1.8V		maximum 200 mA
GPIO_A_0	D17	PDM_BIT_STREAM1	GPIO1_IO10	General purpose I/O Contact A0	I/O CMOS	1.8V		

Contact Name OSM	Contact Acronym	CPU Contact	Signal Name	Functional Description	I/O Type	I/O Level	PU / PD	Comments
GPIO_A_1	E17	GPIO_IO18	GPIO2_IO18	General purpose I/O Contact A1	I/O CMOS	1.8V		
GPIO_A_2	F17	GPIO_IO03	GPIO2_IO03	General purpose I/O Contact A2	I/O CMOS	1.8V		
GPIO_A_3	G17	GPIO_IO22	GPIO2_IO22	General purpose I/O Contact A3	I/O CMOS	1.8V		
GPIO_A_4	H17	GPIO_IO28	GPIO2_IO28	General purpose I/O Contact A4	I/O CMOS	1.8V		
GPIO_A_5	J17	GPIO_IO29	GPIO2_IO29	General purpose I/O Contact A5	I/O CMOS	1.8V		
GPIO_A_6	K17	CCM_CLKO1	GPIO3_IO26	General purpose I/O Contact A6	I/O CMOS	1.8V		Dual function: SPI_A_CS1#
GPIO_A_7	L17	CCM_CLKO2	GPIO3_IO27	General purpose I/O Contact A7	I/O CMOS	1.8V		Dual function: SPI_B_CS1#
GPIO_B_0	D19	CCM_CLKO3	GPIO4_IO28	General purpose I/O Contact B0	I/O CMOS	1.8V		
GPIO_B_1	E19	GPIO_IO02	GPIO2_IO02	General purpose I/O Contact B1	I/O CMOS	1.8V		
GPIO_B_2	F19	CCM_CLKO4	GPIO4_IO29	General purpose I/O Contact B2	I/O CMOS	1.8V		
GPIO_B_3	G19							
GPIO_B_4	H19							
GPIO_B_5	J19							
GPIO_B_6	K19							
GPIO_B_7	L19							
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 signal is open drain. During command transfer this signal is in push-pull mode.	I/O CMOS	1.8V or 3.3V		
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		

Contact Name OSM	Contact Acronym	CPU Contact	Signal Name	Functional Description	I/O Type	I/O Level	PU / PD	Comments
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							
SDIO_A_PWR_EN	D21	SD2_RESET_B	SD2_RESET_B	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	P	1.8V or 3.3V		maximum 100 mA
SDIO_B_CLK	K20	SD3_CLK	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	1.8V		
SDIO_B_CMD	K21	SD3_CMD	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	1.8V		
SDIO_B_D0	L20	SD3_DATA0	SD3_DATA0	SDIO B Data lines. These signals operate in push-pull mode.	I/O CMOS	1.8V		
SDIO_B_D1	L21	SD3_DATA1	SD3_DATA1	SDIO B Data lines. These signals operate in push-pull mode.	I/O CMOS	1.8V		
SDIO_B_D2	M21	SD3_DATA2	SD3_DATA2	SDIO B Data lines. These signals operate in push-pull mode.	I/O CMOS	1.8V		
SDIO_B_D3	N20	SD3_DATA3	SD3_DATA3	SDIO B Data lines. These signals operate in push-pull mode.	I/O CMOS	1.8V		
SDIO_B_D4	N21							
SDIO_B_D5	P20							
SDIO_B_D6	P21							
SDIO_B_D7	R21							

Contact Name OSM	Contact Acronym	CPU Contact	Signal Name	Functional Description	I/O Type	I/O Level	PU / PD	Comments
SDIO_B_CD#	T21							
SDIO_B_WP	U20							
SDIO_B_PWR_EN	U21							
SDIO_B_IOPWR	T20		VDD_1V8	SDIO B Voltage. It is used to provide the IO Voltage Level	P	1.8V		maximum 100 mA
PWM_0	E18	GPIO_IO24	TPM3_CH3	Pulse width modulation 0	O CMOS	1.8V		Dual function: DISP_BL_PWM
PWM_1	F18	GPIO_IO23	TPM6_CH1	Pulse width modulation 1	O CMOS	1.8V		
PWM_2	G18	GPIO_IO21	TPM4_CH1	Pulse width modulation 2	O CMOS	1.8V		
PWM_3	H18							
PWM_4	J18							
PWM_5	K18							
ADC_0	M18	ADC_IN0	ADC_IN0	Analog Digital Converter 0	Analog	0V - 1.8V		
ADC_1	N18	ADC_IN1	ADC_IN1	Analog Digital Converter 1	Analog	0V - 1.8V		
SPI_A_SDI_(IO0)	U15	SAI1_TXC	SPI1_SIN	SPI A Serial Data Input	IO CMOS	1.8V		
SPI_A_SDO_(IO1)	V15	SAI1_RXD0	SPI1_SOUT	SPI A Serial Data Output	IO CMOS	1.8V		
SPI_A_/WP_(IO2)	W16							
SPI_A_/HOLD_(IO3)	W15							
SPI_A_CS0#	Y15	SAI1_TXF	SPI1_PCS0_BUF	SPI A Master Chip Select 0	O CMOS	1.8V		
SPI_A_SCK	U16	SAI1_TXD0	SPI1_SCK	SPI A Serial Data Clock	O CMOS	1.8V		
SPI_B_SDI	Y22	GPIO_IO13	SPI8_SIN	SPI B Serial Data Input	I CMOS	1.8V		
SPI_B_SDO	Y23	GPIO_IO14	SPI8_SOUT	SPI B Serial Data Output	O CMOS	1.8V		
SPI_B_CS0#	AA23	GPIO_IO12	SPI8_PCS0	SPI B Master Chip Select 0	O CMOS	1.8V		
SPI_B_SCK	Y21	GPIO_IO15	SPI8_SCK	SPI B Serial Data Clock	O CMOS	1.8V		no external pull resistors allowed. BOOT_MODE3
I2S_A_DATA_IN	V21	GPIO_IO20	SAI3_RXD	I2S A Digital audio Input	I/O CMOS	1.8V		

Contact Name OSM	Contact Acronym	CPU Contact	Signal Name	Functional Description	I/O Type	I/O Level	PU / PD	Comments
I2S_A_DATA_OUT	W21	GPIO_IO19	SAI3_TXD	I2S A Digital audio Output	I/O CMOS	1.8V		
I2S_B_DATA_IN	V19							
I2S_B_DATA_OUT	W19							
I2S_MCLK	V18	GPIO_IO17	SAI3_MCLK	Master clock output to I2S codec(s)	I/O CMOS	1.8V		
I2S_LRCLK	W18	GPIO_IO26	SAI3_TXFS	I2S Left & Right synchronization clock	I/O CMOS	1.8V		
I2S_BITCLK	W20	GPIO_IO16	SAI3_TXC	I2S Digital audio clock	I/O CMOS	1.8V		
CAN_A_TX	AC17	PDM_CLK	CAN1_TX	CAN port A Transmit output	O CMOS	1.8V		
CAN_A_RX	AB17	PDM_BIT_STREAM0	CAN1_RX	CAN port A Receive input	I CMOS	1.8V		
CAN_B_TX	AC19	GPIO_IO25	CAN2_TX	CAN port B Transmit output	O CMOS	1.8V		
CAN_B_RX	AB19	GPIO_IO27	CAN2_RX	CAN port B Receive input	I CMOS	1.8V		
USB_A_D_N	AB13	USB1_D_N	USB1_D_N	USB differential data pairs for port A	I/O USB	USB		
USB_A_D_P	AC14	USB1_D_P	USB1_D_P	USB differential data pairs for port A	I/O USB	USB		
USB_A_ID	AB14	USB1_ID	USB1_ID	Input Contact to announce OTG device insertion on USB 2.0 port	I OD CMOS	1.8V	PU 10k	
USB_A_OC#	AC15		USB_A_OC#	USB over-current for port A	I OD CMOS	1.8V	PU 10k	only a Pull-Up, no CPU pin connected
USB_A_VBUS	AB16	USB1_VBUS	USB1_VBUS	USB port 0 port power detection	I USB VBUS 5V	USB VBUS 5V		
USB_A_EN	AC16		USB_A_EN	Power enable for USB VBUS voltage	O CMOS	1.8V	PU 10k	only a Pull-Up, no CPU pin connected
USB_B_D_N	AB23	USB2_D_N	USB2_D_N	USB differential data pairs for port B	I/O USB	USB		
USB_B_D_P	AC22	USB2_D_P	USB2_D_P	USB differential data pairs for port B	I/O USB	USB		
USB_B_ID	AB22	USB2_ID	USB2_ID	Input Contact to announce OTG device insertion on USB 2.0 port	I OD CMOS	1.8V	PU 10k	

Contact Name OSM	Contact Acronym	CPU Contact	Signal Name	Functional Description	I/O Type	I/O Level	PU / PD	Comments
USB_B_OC#	AC21		USB_B_OC#	USB over-current for port B	I OD CMOS	1.8V	PU 10k	only a Pull-Up, no CPU pin connected
USB_B_VBUS	AB20	USB2_VBUS	USB2_VBUS	USB port 0 port power detection	I USB VBUS 5V	USB VBUS 5V		
USB_B_EN	AC20		USB_B_EN	Power enable for USB VBUS voltage	O CMOS	1.8V	PU 10k	only a Pull-Up, no CPU pin connected
I2C_A_SCL	AA15	I2C2_SCL	I2C2_SCL	I2C Port A Clock Signal	I/O OD CMOS	1.8V	PU 2k2	
I2C_A_SDA	AA16	I2C2_SDA	I2C2_SDA	I2C Port A Data Signal	I/O OD CMOS	1.8V	PU 2k2	
I2C_B_SCL	AA20	GPIO_IO01	I2C3_SCL	I2C Port B Clock Signal	I/O OD CMOS	1.8V	PU 2k2	
I2C_B_SDA	AA21	GPIO_IO00	I2C3_SDA	I2C Port B Data Signal	I/O OD CMOS	1.8V	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							

Contact Name OSM	Contact Acronym	CPU Contact	Signal Name	Functional Description	I/O Type	I/O Level	PU / PD	Comments
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			Reserved for future use				
Vendor Defined	B22							
Vendor Defined	C16		RTC_EVI	RTC Event Input	I OD CMOS	RTC_PWR	PU 10k	
Vendor Defined	P16		WDOG_B	watchdog output from CPU (WDOG_ANY)	O OD CMOS	1.8V		
VCC_5_TEST	Y3		VDD_3V3	Module power voltage test point	P			
VCC_6_TEST	C5		VDD_1V8	Module power voltage test point	P			
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	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	1.8 to 5V	PU 10K	

Contact Name OSM	Contact Acronym	CPU Contact	Signal Name	Functional Description	I/O Type	I/O Level	PU / PD	Comments
ETH_B_(R)(G)MII_CRS	D2							
ETH_B_(R)(G)MII_COL	E1							
ETH_B_(S)(R)(G)MII_TXD0	G1	ENET1_TD0	ENET1_TD0	Transmit data bit 0 (transmitted first) port B	O CMOS	1.8V		
ETH_B_(S)(R)(G)MII_TXD1	F1	ENET1_TD1	ENET1_TD1	Transmit data bit 1 port B	O CMOS	1.8V		
ETH_B_(S)(R)(G)MII_TXD2	G2	ENET1_TD2	ENET1_TD2	Transmit data bit 2 port B	O CMOS	1.8V		
ETH_B_(S)(R)(G)MII_TXD3	F2	ENET1_TD3	ENET1_TD3	Transmit data bit 3 port B	O CMOS	1.8V		
ETH_B_(R)(G)MII_TX_EN(_ER)	J2	ENET1_TX_CTL	ENET1_TX_CTL	Transmit enable (Error) port B	O CMOS	1.8V		
ETH_B_(R)(G)MII_TX_CLK	H1	ENET1_TXC	ENET1_TXC	Transmit clock port B	I/O CMOS	1.8V		
ETH_B_(S)(R)(G)MII_RXD0	J1	ENET1_RD0	ENET1_RD0	Receive data bit 0 (received first) port B	I CMOS	1.8V		
ETH_B_(S)(R)(G)MII_RXD1	K1	ENET1_RD1	ENET1_RD1	Receive data bit 1 port B	I CMOS	1.8V		
ETH_B_(R)(G)MII_RXD2	M1	ENET1_RD2	ENET1_RD2	Receive data bit 2 port B	I CMOS	1.8V		
ETH_B_(R)(G)MII_RXD3	N1	ENET1_RD3	ENET1_RD3	Receive data bit 3 port B	I CMOS	1.8V		
ETH_B_(R)(G)MII_RX_ER	K2							
ETH_B_(R)(G)MII_RX_DV(_ER)	L1	ENET1_RX_CTL	ENET1_RX_CTL	Receive data valid (Error) port B	I CMOS	1.8V		
ETH_B_(R)(G)MII_RX_CLK	P1	ENET1_RXC	ENET1_RXC	Receive clock port B	I/O CMOS	1.8V		
ETH_B_SDP	M2							
ETH_B_MDIO	C7	ENET1_MDIO	ENET1_MDIO	Management bus data signal for Ethernet B	I/O CMOS	1.8V		
ETH_B_MDC	C6	ENET1_MDC	ENET1_MDC	Management bus clock signal for Ethernet B	O CMOS	1.8V		

Contact Name OSM	Contact Acronym	CPU Contact	Signal Name	Functional Description	I/O Type	I/O Level	PU / PD	Comments
GPIO_C_0	D3							
GPIO_C_1	D4							
GPIO_C_2	E3							
GPIO_C_3	E4							
GPIO_C_4	F3							
GPIO_C_5	F4							
GPIO_C_6	G3							
GPIO_C_7	G4							
DSI_DATA0_N	AB11	MIPI_DSI1_D0_N	MIPI_DSI1_D0_N	DSI differential output (point to point)	O LVDS D-PHY			
DSI_DATA0_P	AB10	MIPI_DSI1_D0_P	MIPI_DSI1_D0_P	DSI differential output (point to point)	O LVDS D-PHY			
DSI_DATA1_N	AC9	MIPI_DSI1_D1_N	MIPI_DSI1_D1_N	DSI differential output (point to point)	O LVDS D-PHY			
DSI_DATA1_P	AC8	MIPI_DSI1_D1_P	MIPI_DSI1_D1_P	DSI differential output (point to point)	O LVDS D-PHY			
DSI_DATA2_N	AC6	MIPI_DSI1_D2_N	MIPI_DSI1_D2_N	DSI differential output (point to point)	O LVDS D-PHY			
DSI_DATA2_P	AC5	MIPI_DSI1_D2_P	MIPI_DSI1_D2_P	DSI differential output (point to point)	O LVDS D-PHY			
DSI_DATA3_N	AB5	MIPI_DSI1_D3_N	MIPI_DSI1_D3_N	DSI differential output (point to point)	O LVDS D-PHY			
DSI_DATA3_P	AB4	MIPI_DSI1_D3_P	MIPI_DSI1_D3_P	DSI differential output (point to point)	O LVDS D-PHY			
DSI_CLOCK_N	AB8	MIPI_DSI1_CLK_N	MIPI_DSI1_CLK_N	DSI differential clock output (point to point)	O LVDS D-PHY			
DSI_CLOCK_P	AB7	MIPI_DSI1_CLK_P	MIPI_DSI1_CLK_P	DSI differential clock output (point to point)	O LVDS D-PHY			
DSI_TE	AA3							

Contact Name OSM	Contact Acronym	CPU Contact	Signal Name	Functional Description	I/O Type	I/O Level	PU / PD	Comments
CSI_DATA0_N	C1	MIPI_CSI1_D0_N	MIPI_CSI1_D0_N	CSI differential input (point to point)	I LVDS D-PHY/ I LVDS M-PHY			
CSI_DATA0_P	B1	MIPI_CSI1_D0_P	MIPI_CSI1_D0_P	CSI differential input (point to point)	I LVDS D-PHY / I LVDS M-PHY			
CSI_DATA1_N	A2	MIPI_CSI1_D1_N	MIPI_CSI1_D1_N	CSI differential input (point to point)	I LVDS D-PHY / I LVDS M-PHY			
CSI_DATA1_P	A3	MIPI_CSI1_D1_P	MIPI_CSI1_D1_P	CSI differential input (point to point)	I LVDS D-PHY / I LVDS M-PHY			
CSI_DATA2_N	A5							
CSI_DATA2_P	A6							
CSI_DATA3_N	B6							
CSI_DATA3_P	B7							
CSI_CLOCK_N	B3	MIPI_CSI1_CLK_N	MIPI_CSI1_CLK_N	CSI differential clock input (point to point)	I LVDS D-PHY			
CSI_CLOCK_P	B4	MIPI_CSI1_CLK_P	MIPI_CSI1_CLK_P	CSI differential clock input (point to point)	I LVDS D-PHY			
CAM_MCK	C2							
I2C_CAM_SDA / CSI_TX_N	C3							
I2C_CAM_SCL / CSI_TX_P	C4							
RGB_R0	Y7							
RGB_R1	AA6							
RGB_R2	Y6							

Contact Name OSM	Contact Acronym	CPU Contact	Signal Name	Functional Description	I/O Type	I/O Level	PU / PD	Comments
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							

Contact Name OSM	Contact Acronym	CPU Contact	Signal Name	Functional Description	I/O Type	I/O Level	PU / PD	Comments
USB_C_VBUS	C9							
USB_C_EN	C10							
USB_C_SSTX_N	A9							
USB_C_SSTX_P	A8							
USB_C_SSRX_N	B11							
USB_C_SSRX_P	B10							
PCIe_A_HSI0_P	AB1							
PCIe_A_HSI0_N	AB2							
PCIe_A_HSO0_P	AC2							
PCIe_A_HSO0_N	AC3							
PCIe_CLKREQ#	W2							
PCIe_A_PERST#	V2							
PCIe_REFCLK_P	W1							
PCIe_REFCLK_N	Y1							
PCIe_WAKE#	T2							
PCIe_SMDAT	U1							
PCIe_SMCLK	T1							
PCIe_SM_ALERT#	R2							
RESERVED	N2, AA2			Reserved for future use				
Vendor Defined	D6	ADC_IN2	ADC_IN2	Analog Digital Converter 2	Analog	0V - 1.8V		
Vendor Defined	D7	ADC_IN3	ADC_IN3	Analog Digital Converter 3	Analog	0V - 1.8V		

Table 7: Pinout of OSM-S i.MX93 DC

9.3 KED specific Pins

Table 9: KED specific Pins of OSM-S i.MX93

Contact Acronym	CPU Contact	Signal Name	Functional Description	I/O Type	I/O Level	PU / PD	Comments
U6	LVDS_CLK_P	LVDS0_CLK_P	LVDS channel 0 differential pair clock lines	O LVDS LCD			
U7	LVDS_CLK_N	LVDS0_CLK_N	LVDS channel 0 differential pair clock lines	O LVDS LCD			
N6	LVDS_D0_P	LVDS0_D0_P	LVDS channel 0 differential pair data lines	O LVDS LCD			
N7	LVDS_D0_N	LVDS0_D0_N	LVDS channel 0 differential pair data lines	O LVDS LCD			
P6	LVDS_D1_P	LVDS0_D1_P	LVDS channel 0 differential pair data lines	O LVDS LCD			
P7	LVDS_D1_N	LVDS0_D1_N	LVDS channel 0 differential pair data lines	O LVDS LCD			
R6	LVDS_D2_P	LVDS0_D2_P	LVDS channel 0 differential pair data lines	O LVDS LCD			
R7	LVDS_D2_N	LVDS0_D2_N	LVDS channel 0 differential pair data lines	O LVDS LCD			
V6	LVDS_D3_P	LVDS0_D3_P	LVDS channel 0 differential pair data lines	O LVDS LCD			
V7	LVDS_D3_N	LVDS0_D3_N	LVDS channel 0 differential pair data lines	O LVDS LCD			
P13							
P12							
V13							
V12							
U13							
U12							
R13							
R12							
N13							
N12							
F9							
G9							
F10							

Contact Acronym	CPU Contact	Signal Name	Functional Description	I/O Type	I/O Level	PU / PD	Comments
G10							
V9							
U9							
V10							
U10							
J6							
J7							
H6							
H7							
G6							
G7							
F6							
F7							
K6							
K7							
L6							
L7							
F12							
F13							
G12							
G13							
H12							
H13							
J12							
J13							
K12							

Contact Acronym	CPU Contact	Signal Name	Functional Description	I/O Type	I/O Level	PU / PD	Comments
K13							
U8		VDD_SOC_0V8	Module power voltage testpoint	P			for testing only
T7							
T8							
T10		VDDQ_DDR	Module power voltage testpoint	P			for testing only
T11		VDD2_DDR_1V1	Module power voltage testpoint	P			for testing only
F8, F11, G8, G11, H8, H11, J8, J11, K8, K11, L8, N8, N11, P8, P11, R8, R11, T6, T12, T13, U11, V8, V11		GND	Module Signal and power return and GND reference	P			
H9							
H10							
L11							
L12		SWOUT	3.3V load switch output pin from PMIC. Can be used to switch SD-Card supply	P			maximum 400mA
L13		SW_EN	Load switch enable input pin.	I CMOS	1.8..3.3V		
T9							

Table 8: KED specific Pins of OSM-S i.MX93 DC

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.

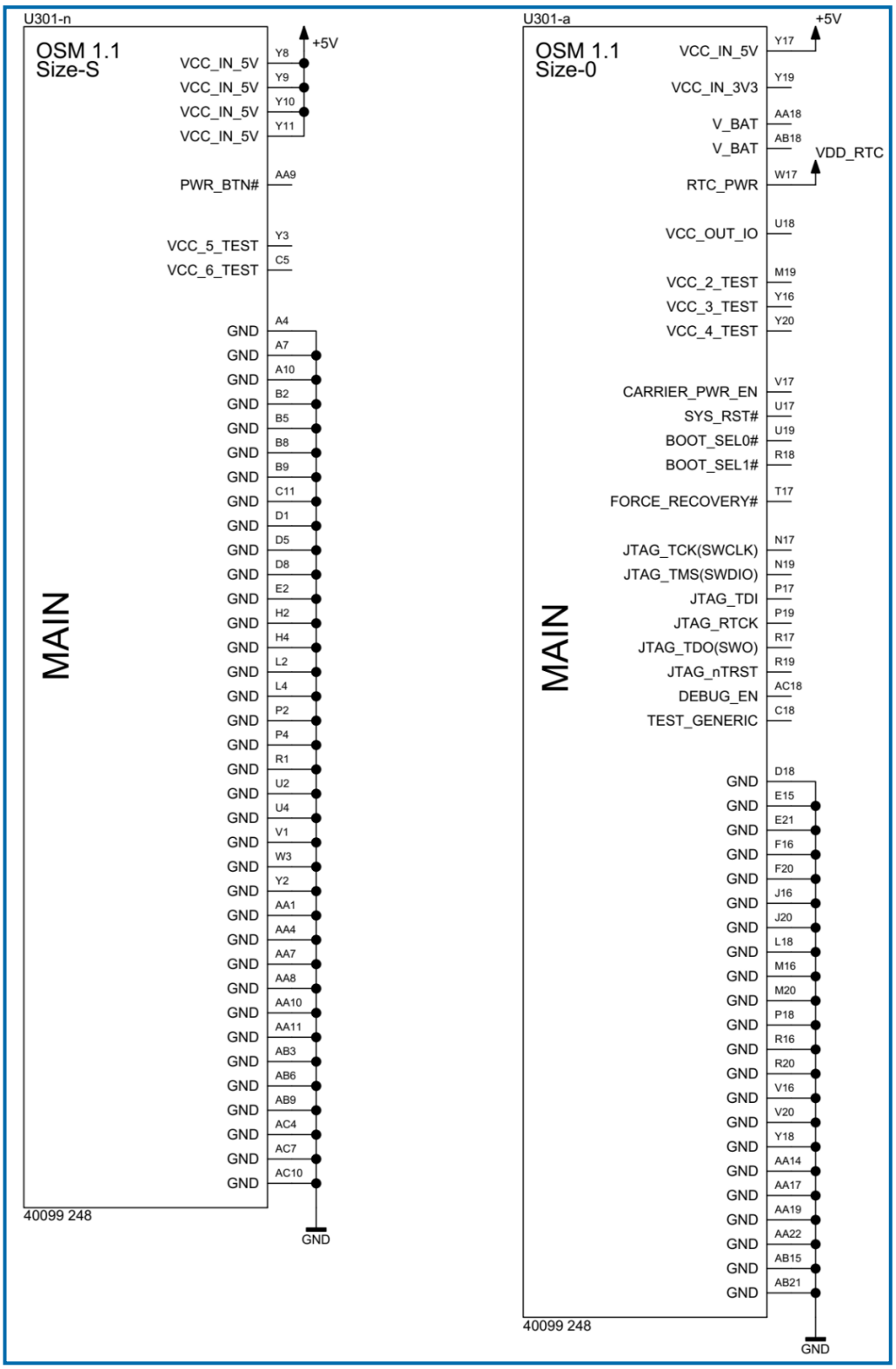

Figure 7: Power Supply Scheme

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 10: 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 11: Supply Current VCC_IN_5V

Use case	typ	max
Linux running	TBD	TBD
stresstest on 2xCPU	TBD	TBD
stresstest on 2xCPU and RAM	TBD	TBD

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 12: 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 13: 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	500 mA
NVCC_SD	+1.8 V / +3.3 V	100 mA

NOTICE

There is no current limiting device for the voltage outputs. Drawing to 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 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 14: FORCE_RECOVERY# Pin Settings

FORCE_RECOVERY#	Boot Type
float	boot from fuses
GND	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.MX93 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.

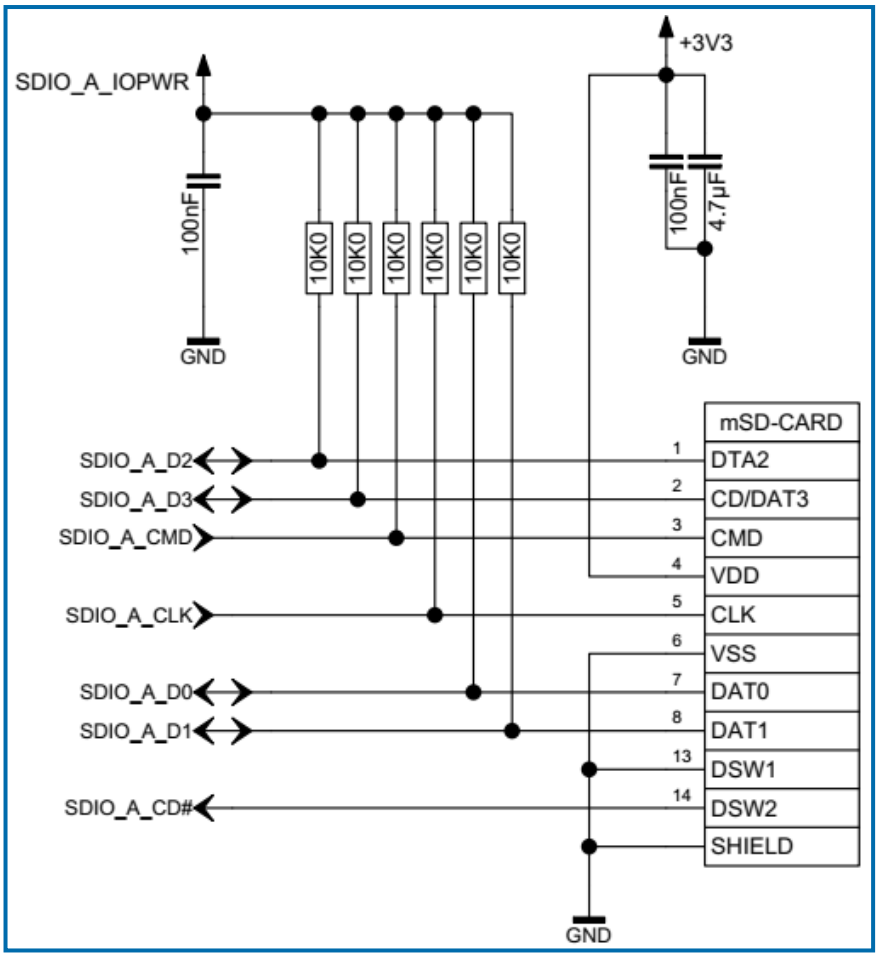

Figure 8: SD-Card Connection Example

Information

If UHS-I mode is required SDIO_A 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 15: Reflow Profile

Profile Feature	Pb-Free Assembly
Average Ramp-Up Rate (TSMAX to T)	3°C/second max.
Preheat Temperature Min (TSMIN) Temperature Max (TSMAX) Time (ts) from (TSMIN to TSMAX)	 150 °C 200 °C 60-120 seconds
Liquidous temperature (T_L) Time (t_L) maintained above T_L	217 °C 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

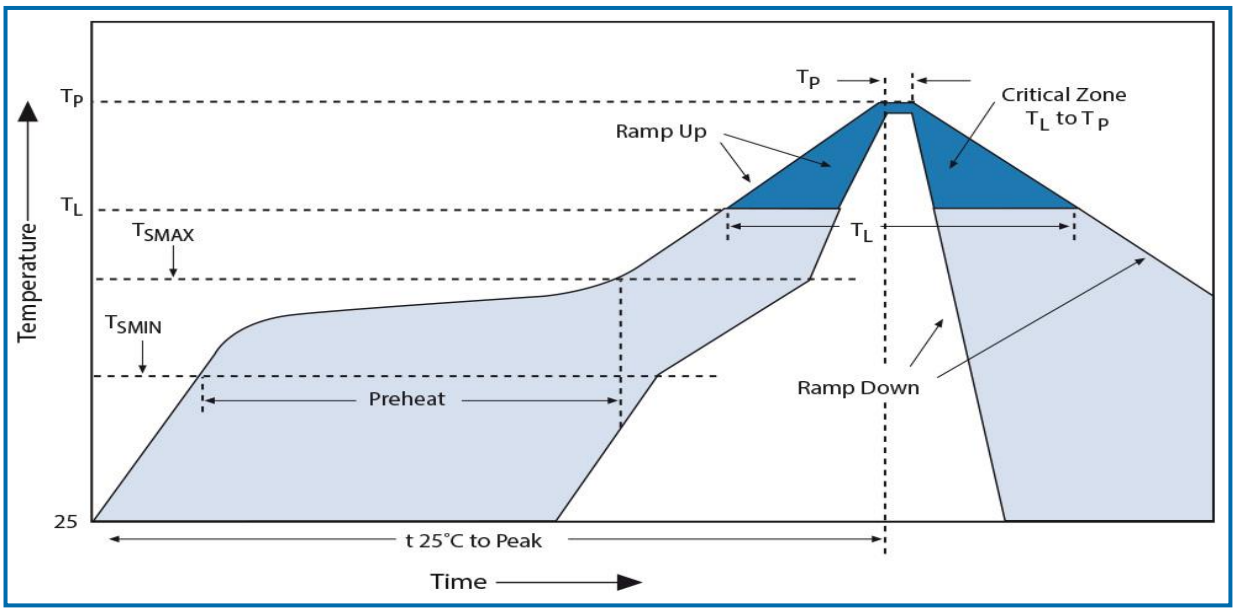

Figure 9: Reflow Classification Profile

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.MX93 DC.

WARNING
Keep the OSM-S i.MX93 DC 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.MX93 DC 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/yocto-ktn/build-ktn-imx/

The online documentation is primarily intended for our Development Kit but will help you also to put your OSM-S i.MX93 DC 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 16: 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 MulitMediaCard	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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