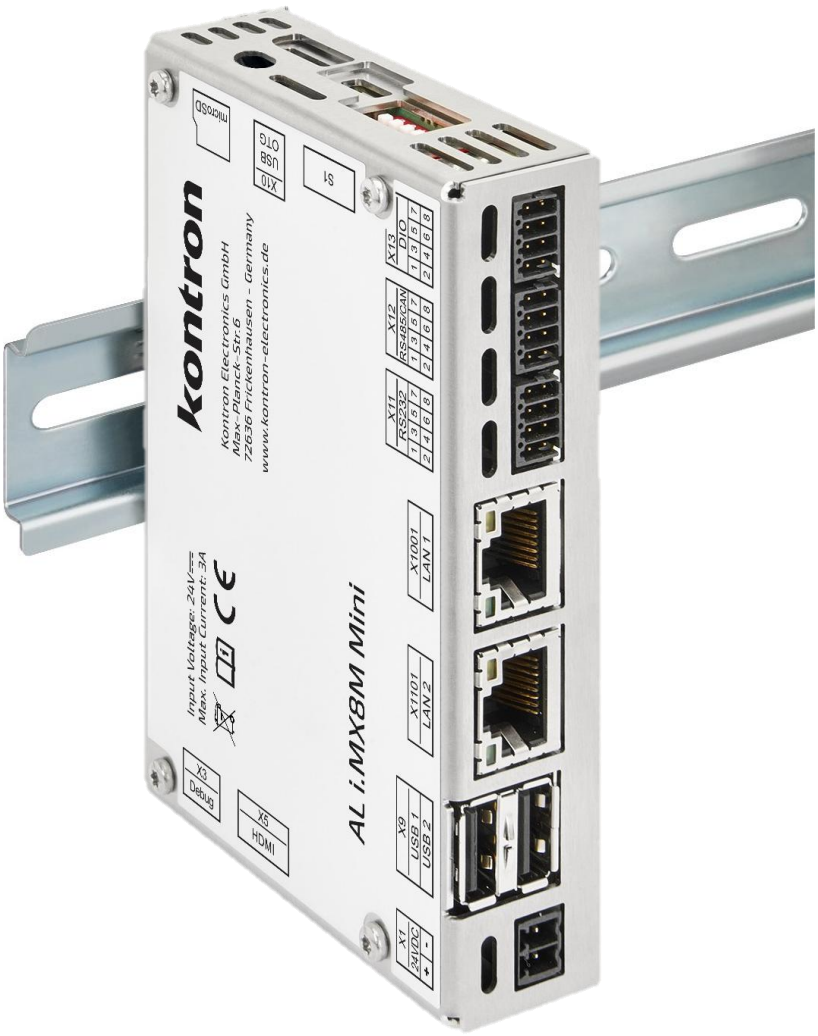

AL i.MX8M Mini

Doc. Rev 3.0

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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	2020-12-08	Arn
Rev. 1.0	Final release	2020-12-21	Arn
Rev. 2.0	ETH LED, photos replaced, formatting and text corrections	2021-12-16	We
Rev. 2.1	Minor corrections	2022-02-22	We
Rev. 2.2	New Logos and photos, minor corrections	2024-06-12	We
Rev. 3.0	Many improvements and changes, new design version	2025-05-14	We

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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).
- AL and DL series products should only be opened to replace a depleted battery. Before opening the housing, disconnect the power supply and ensure that the product is completely de-energized. Ensure that all interfaces of the device are also disconnected.

WARNING
Risk of explosion if the battery is not replaced according to the instructions! (short circuit, reverse polarity, incorrect battery type). Dispose of used batteries in accordance with the manufacturer's instructions.

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.

Important notes on the power supply

- Please note: Safe use of the product is only possible if the external DC power supply meets the criteria for LPS and PS2 (UL/IEC 62368-1).
- Connect the product only to a power supply (PSU) that provides the input power (max. current) specified on the Kontron nameplate or in the User-Guide and that complies with the Limited Power Source (LPS) and Power Source (PS2) requirements of UL/IEC 62368-1.
- Safe operation is not possible if exposed parts of circuits carrying dangerous voltages or energies can be touched directly or indirectly.
- Safe operation is not possible if there is no disconnecting device that removes the hazardous energy content from the point of disconnection within 2 seconds.
- The cross-section of the supply wires must be selected in accordance with the maximum current specified on the nameplate of the device, in accordance with the provisions of EN62368-1 or VDE0100 or EN60204 or UL61010-1.
- The power supply serves as the primary disconnect device from the mains (AC) and is used to remove all DC power from the board / system.
- The AL or DL housing must be earthed using the screw provided.

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 product in its antistatic bag. › Handle the product at an approved ESD workstation. › Handle electronic boards 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 together in a product specific cardboard package 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

Included in this delivery:

- AL i.MX8M Mini
- Safety Instructions
- DC Power Connector (2-pin Phoenix Contact)

5.4 Type Label and Product Identification

Figure 1: AL i.MX8M Mini Type Label

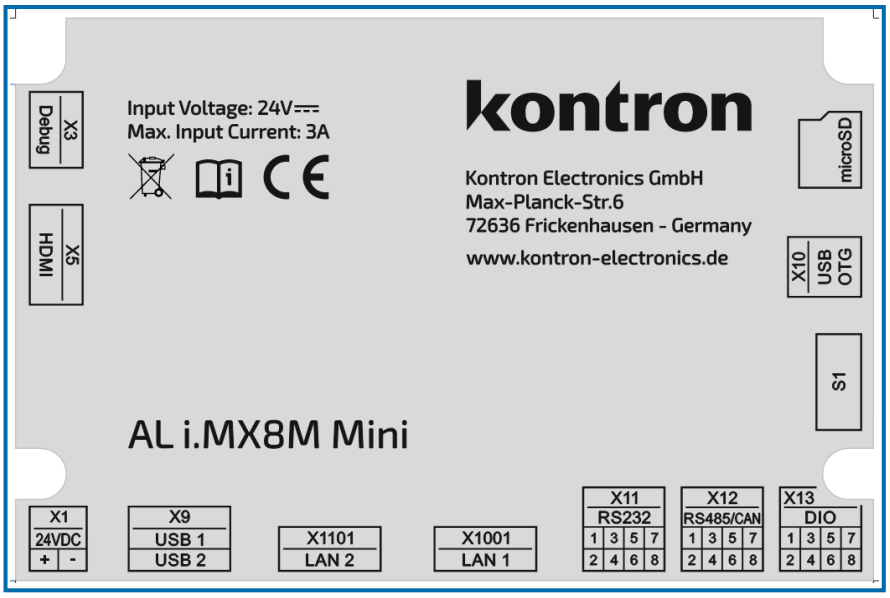
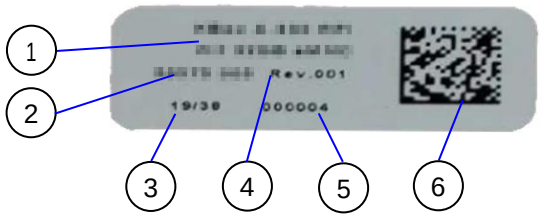


Table 2: Product Identification



Detail	Description
1	Product name (AL i.MX8M Mini)
2	Article number
3	Production date
4	Revision number
5	Serial number
6	Barcode with article-, rev., date and serial number
7	MAC address
8	MAC address (barcode)

5.5 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 single board computer AL 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 Page.

Kontron Electronics' AL i.MX8M Mini is developed specifically for sophisticated 3D graphics applications and computing-intensive system architectures. The fanless design ensures a significantly prolonged lifespan and high system availability.

Exploring the AL i.MX8M Mini

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

7 Starting Up

Before using the system, become familiar with the system components and follow the startup instructions below.

7.1 Connecting to Power Supply

The AL i.MX8M Mini connects to a DC main power supply via a Phoenix Contact input power connector and corresponding power cable.

Information

When starting the AL i.MX8M Mini, the functional earth connection must always be made first and disconnected last. Kontron Electronics recommended that the last connections attached to the system should be the power cable. Following a proper cabling procedure will prevent a false power-on condition, which could result in an operational failure.

CAUTION

The AL i.MX8M Mini must be connected to a DC mains power supply complying with the SELV (Safety Extra Low Voltage) requirements of UL/IEC 62368-1 standard. It must be observed that wiring and short-circuit/overcurrent protection is performed according to the applicable standards, regulations and respect to the electrical specification of the AL i.MX8M Mini. The disconnecting device (fuse/circuit breaker) rating must be in accordance with the AL i.MX8M Mini's wire cross-section.

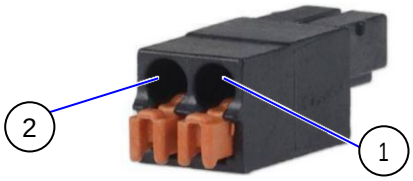
To start the AL i.MX8M Mini, follow the steps below:

- Ensure that the DC power source is switched off via a disconnecting device (circuit breaker), in order to ensure that no power is flowing from the external DC power source during the connection procedure.
- Connect the wired mating power connector (refer to the next Chapter) to the input power connector located at the front, see chapter 10: Connector.
- Pay attention to the polarity of the connections. For more information on the input power connector's polarity, see Chapter 10.2.
- Connect the DC power cable's other end to the DC main power supply.
- Switch on the disconnecting device (circuit breaker) in order to apply voltage to the AL i.MX8M Mini.

7.2 Wiring the DC Mating Power Connector

The AL i.MX8M Mini is connected by the input power connector on the front to a DC power source via a DC power supply wiring consisting of the power mating connector and the assembled wires. For information on how to wire the connector, see next Chapter.

Table 3: Wiring the Power Mating Connector

2-Pin Power Mating Connector	Pin	Signal Name
	1	Location for inserting the 24 V wire
	2	Location for inserting the 0 V wire

NOTICE

The current of the power supply should be limited to 3 A.

To wire the power mating connector, follow the steps below:

- Cut two (0.5…1.5 mm²) AWG 20…16 isolated wires to the required length and strip each end 5…7 mm.
- Twist the striped wire-ends and provide them with ferrules.
- Press the contact levers of the power mating connector down - far enough so that you can insert the end of the prepared wires.
- Insert the wires into the corresponding clamp of the Phoenix power mating connector. Make sure that you have the right polarity of the connection. For the pin assignment of the input power connector, refer to Chapter 10.2:
- Input Power Connector.

Information

The wires used for power connections must be clearly marked (+/ -) to ensure proper connection to the front panel input power connector and to the main power source. In addition, the cables must have some form of support to minimize the strain on the unit's connectors.

7.3 Din Rail Mounting

The AL i.MX8M Mini is a rail mount PC box, designed for use in a DIN rail enclosure or housing by attaching a DIN rail mounting clamp. The DIN rail mounting clamp can be attached on the rear side of the chassis.

To attach the DIN Rail mounting clamp, follow the steps below:

- Make sure that the DIN Rail mounting clamp is in the upright position.
- Clip the top of the DIN rail clamp into the DIN rail and push the bottom of the DIN rail firmly until it clamps on to the bottom of the DIN rail.

7.4 Operating System (OS) and Drivers

The standard AL i.MX8M Mini is fully operational when switched on for the first time with pre-installed OS and drivers. Drivers are available from Kontron Electronics' GitLab Server https://git.kontron-electronics.de.

If ordered without pre-installed OS, before starting the AL i.MX8M Mini the operating system and the appropriate drivers need to be installed for the ordered system configuration.

8 Product Overview

The AL i.MX8M Mini is a flexible single board computer fanless device designed for use in demanding applications. Based on the i.MX8 (4x Arm® Cortex®-A53, 1x Arm® Cortex®-M4) Quad processor the AL i.MX8M Mini features long-term availability and supports a varied number of onboard interfaces to enable connectivity to nearly all applications. A microSD card slot supports memory expansion for flexible data storage.

Information

All variants are also available as a separate product named Board-Line BL i.MX8M without housing.

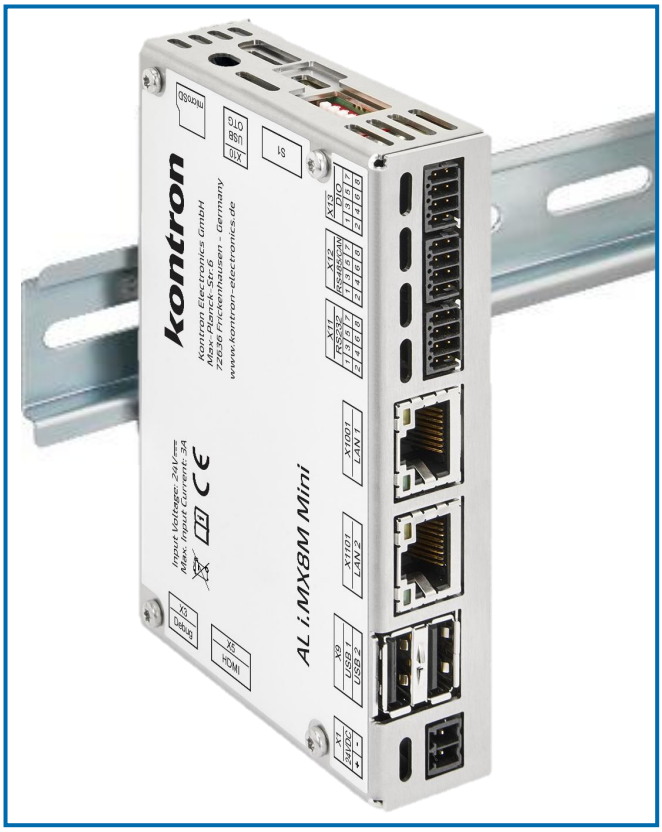


Figure 2: AL i.MX8M Mini

Information

The AL i.MX8M Mini is designed for operation in a DIN rail environment using a vertical orientation.

8.1 Main Characteristics

Main characteristics of the AL i.MX8M Mini are:

- i.MX8 MIMX8MM6CVTKZAA:
  - 4x Arm® Cortex®-A53 @1,6 GHz (1,8GHz)
  - 1x Arm® Cortex®-M4 processor @400 MHz
  - 2D GPU and 3D GPU
- 1 GB up to 4GB LPDDR4 RAM
- 8 GB up to 64 GB eMMC
- External microSD card slot
- External Interfaces: 1x HDMI, 2x Ethernet (1x Gbit/s, 1x 10/100 Mbit/s), 2x USB 2.0, 1x USB OTG, 1xRS232, 1x RS485, 1x CAN, 4x DIO (24 V / 800 mA)
- Fanless passive cooling

The AL i.MX8M Mini is intended for 24/7 continuous operation and longtime industrial applications. All components are selected to ensure a long lifetime.

8.2 Product Variants

Table 4: Product Variants of AL i.MX8M Mini

Item	Description	Product Number
AL i.MX8M Mini 1 GB/8 GB	Automation Line with NXP i.MX8M Mini quad core processor, 1 GB LPDDR4 and 8 GB eMMC	50099 067
AL i.MX8M Mini 4 GB/32 GB	Automation Line with NXP i.MX8M Mini quad core processor, 4 GB LPDDR4 and 32 GB eMMC	50099 068
Other systems on request		

8.3 Related Products and Accessories

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

- SL i.MX8M Mini (SoM Line)
- BL i.MX8M Mini (Board Line, including soldered-on SL i.MX8M Mini)
- DK i.MX8M Mini (Development Kit, including BL i.MX8M Mini)
- AL i.MX8M Mini (Automation Line, including BL i.MX8M Mini)
- DL i.MX8M Mini (Display Line, including BL i.MX8M Mini)
- Other systems on request

Table 5: Accessories of AL i.MX8M Mini

Item	Description	Product Number
MicroSD Card	MicroSD Card 16 GB	1 0600 338
Power Supply	External power supply 230 V AC to 24 V DC / 18 W incl. 2-pin power connector (Phoenix Contact origin no. 1826680)	30099 001
Connector Set RS232/RS485/CAN/DIO mating connector	Connector set contains: - 1x RS232: 8-pin; - 1x RS485/CAN: 8-pin; - 1x DIO: 8-pin (Phoenix Contact origin no. 1844594)	30099 006
USB-UART Debug-Adapter	Translates the UART signals provided on the Debug connector to USB for connecting the AL i.MX8M Mini to a computer	40099 101
USB-Cable	Connects the Mini-B Debug connector of the AL i.MX8M Mini to the USB-A of the Debug-Adapter	1 860 1154

9 System Specification

9.1 Technical Specification

The AL i.MX8M Mini implements the following technical specification.

Table 6: Technical Specification

Processor	› 4x Arm® Cortex®-A53 @1.6 GHz, › 1x Arm® Cortex®-M4 @400 MHz, 2D GPU and 3D GPU
System Memory	› LPDDR4-RAM 1 GB up to 4 GB
Storage	› 8 GB eMMC up to 64 GB › 2 MB NOR Flash › 64 kbit EERAM (nvSRAM)
Interfaces	› 2x USB 2.0, USB A › 1x USB OTG, Micro-USB › 1x Debug, Mini-B USB › 1x 1 Gbit/s, 1x 10/100 Mbit/s Ethernet, RJ45 › 1x HDMI › 1x RS232, 1x RS485 › 1x CAN › 4x DIO (24 V DC / up to 800 mA)
Expansion Sockets	› 1x MicroSD Card Slot
Power	› 24 V DC ±20 % Input

Table 7: Software Specification

Operating System (OS)	Yocto Linux BSP (demo) documentation and support: docs.kontron-electronics.de

9.2 Environmental Specification

Table 8: Environmental Conditions

Temperature (Operating)	0°C...55 °C ambient, non-condensing
Temperature (Storage)	-20...70 °C ambient, non-condensing
IP protection Class	IP20
Pollution	Degree II

Cooling
The AL i.MX8M Mini is designed for operation in a customer-specific cabinet or device. 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.

9.3 Mechanical Specification

Table 9: Mechanical Specification

Dimension	AL i.MX8M Mini (form factor 4,3")
Width	111 mm (4.37")
Depth	76 mm (3")
Height	25 mm (1")
Weight (chassis only)	Approx. ~0.3 kg (~0.66 lbs.)
Construction	Stainless Steel housing
Mounting	DIN Rail

For more detailed mechanical information, refer to the following outline dimensions drawings within this chapter. Each dimension drawing shows the main external mechanical features such as the position and size of mounting holes for the DIN rail mounting clamp (measurements in millimetres).

The DIN rail mounting clamp is 7 mm thick.

Figure 3: Bottom view

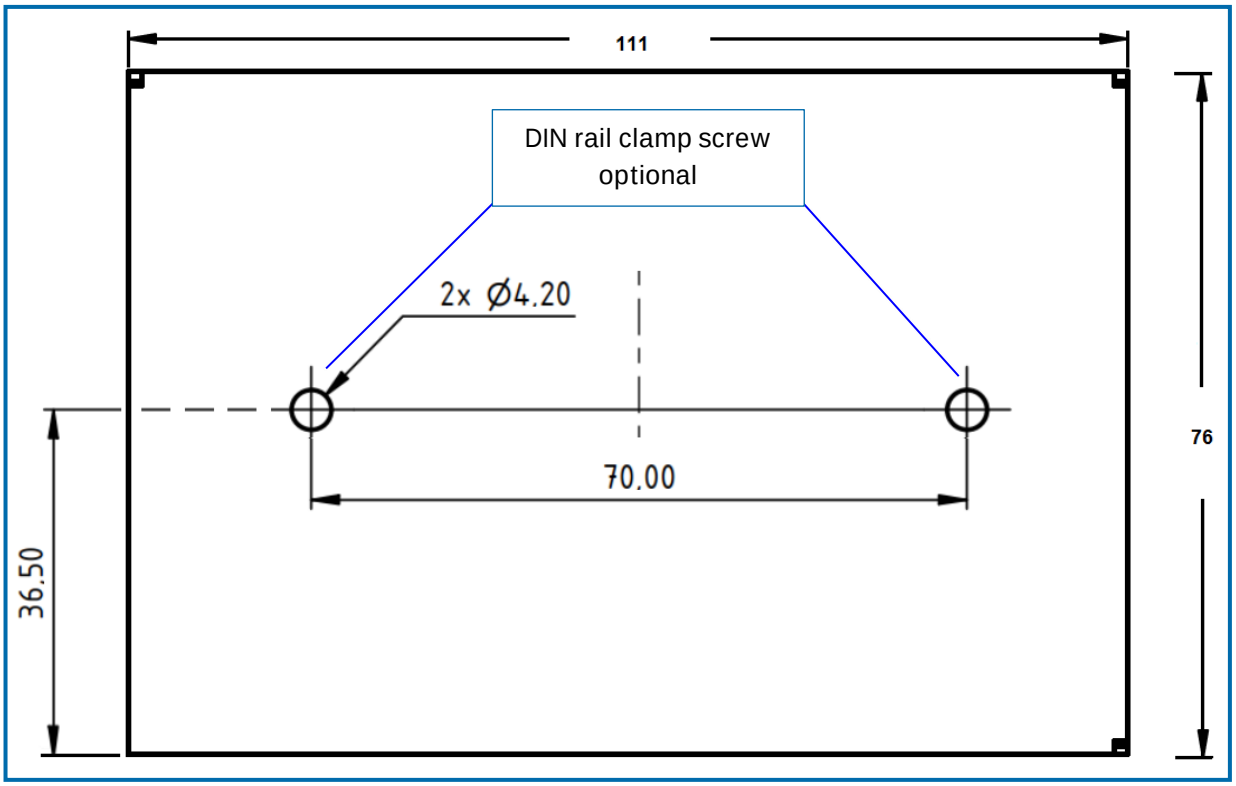


Figure 4: Front view

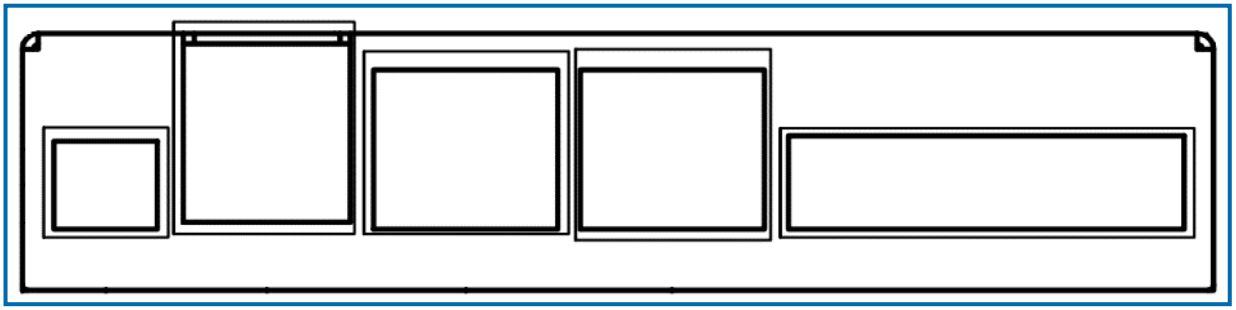


Figure 5: Rear view

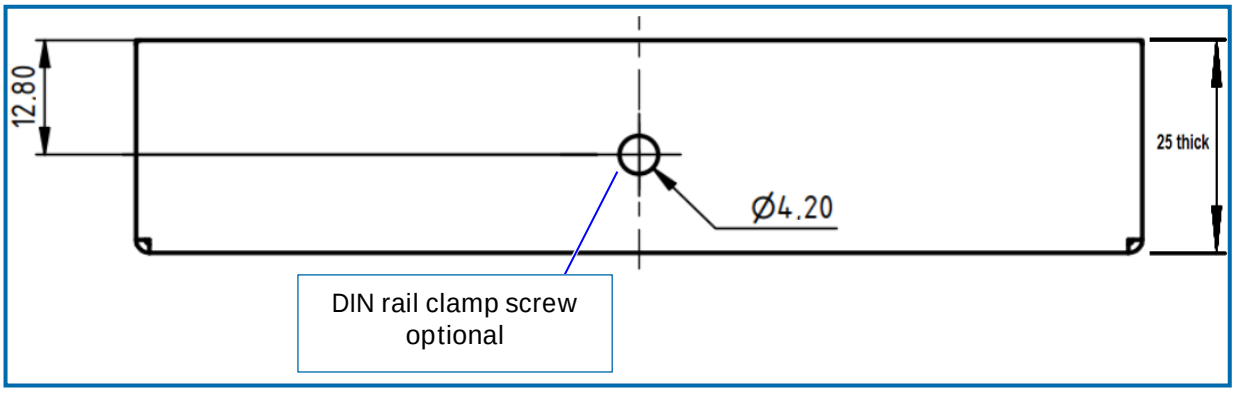
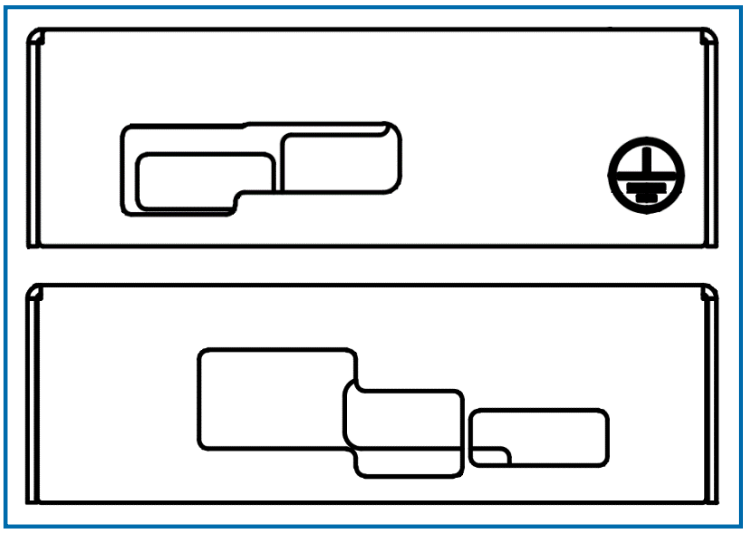


Figure 6: Side views



9.4 Power Specification

The AL i.MX8M Mini is powered by a 2-pin input power connector on the front and has no internal power supply. The standard input voltage of 24 V DC is converted internally to supply all other required voltages.

NOTICE
The current of the power supply should be limited to 3 A.
Performing a forced shutdown can lead to loss of data!

Table 10: Power Specification

Nominal Input Voltage	24 V DC
Input Voltage Range	24 V DC ±20 %
Input Power	Max. 3 A
Nominal Power Consumption	3 W
Output Current 5 V	2 A
Output Current DOUT (24 V)	2.5 A
Input Power Mating Connector	2-pin Phoenix Contact 180° FMC 1,5/2-ST-3,5 (Phoenix 1826680)

Information
The CR1220 coin cell is solely used to power the real time clock (RTC) and has no function in the rest of the system's power supply.

Information
The power consumption of the AL i.MX8M Mini varies depending on the installed components and external peripherals, for more information see Table 11: Power Consumption

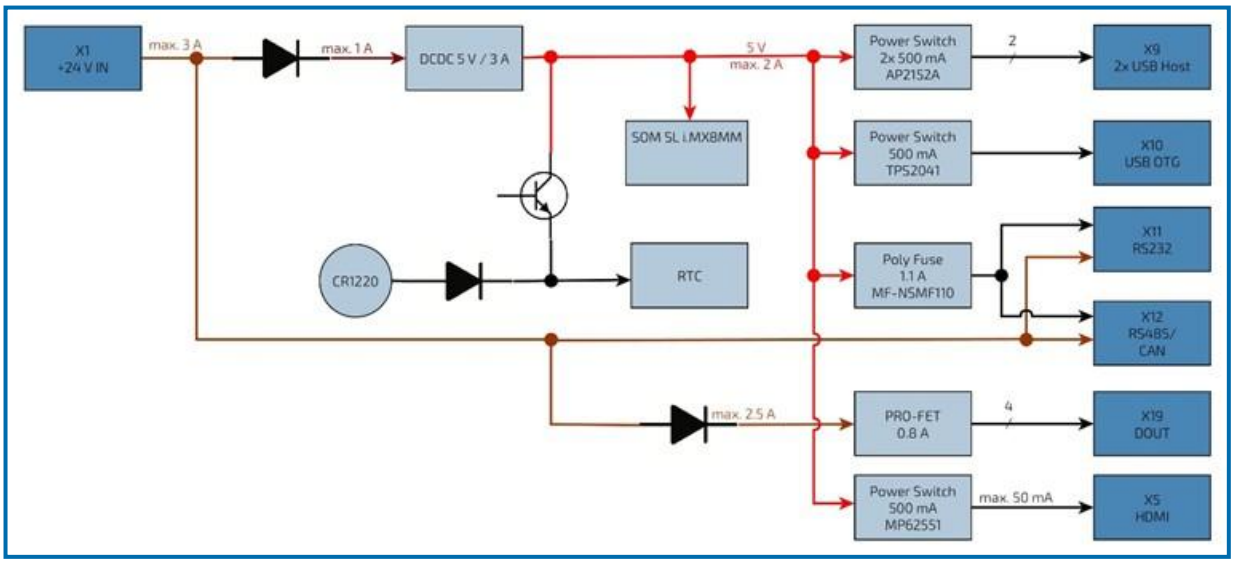


Figure 7: Power Tree

Table 11: Power Consumption

Power Figures SBC	AL i.MX8M Mini
iMX8M Mini Deep Sleep Mode	not supported
iMX8M Mini idle default	570 mW
iMX8M Mini run	670…2400 mW
1x HDMI	5 V * 50 mA = 250 mW
LAN 1	600 mW
LAN 2	300 mW
2x USB 2.0	2x 5 V * 500 mA = 5 W
1x USB OTG	5 V * 500 mA = 2.5 W
DOUT	2.5 A * 24 V = 60 W

I.MX8M Mini power numbers are typical values based on typical silicon at 25 °C. Power numbers distributed to external devices are max. allowed values, partially overcurrent protected.

NOTICE
Please refer to NXP i.MX8M Mini Power Consumption Application Note for further details.

9.5 Earthing System

There is a functional earth self-clinching nut on the side of the housing connected to the electronic ground inside the system and to the mounting clamp on the backside.

9.6 Functional Block Diagram

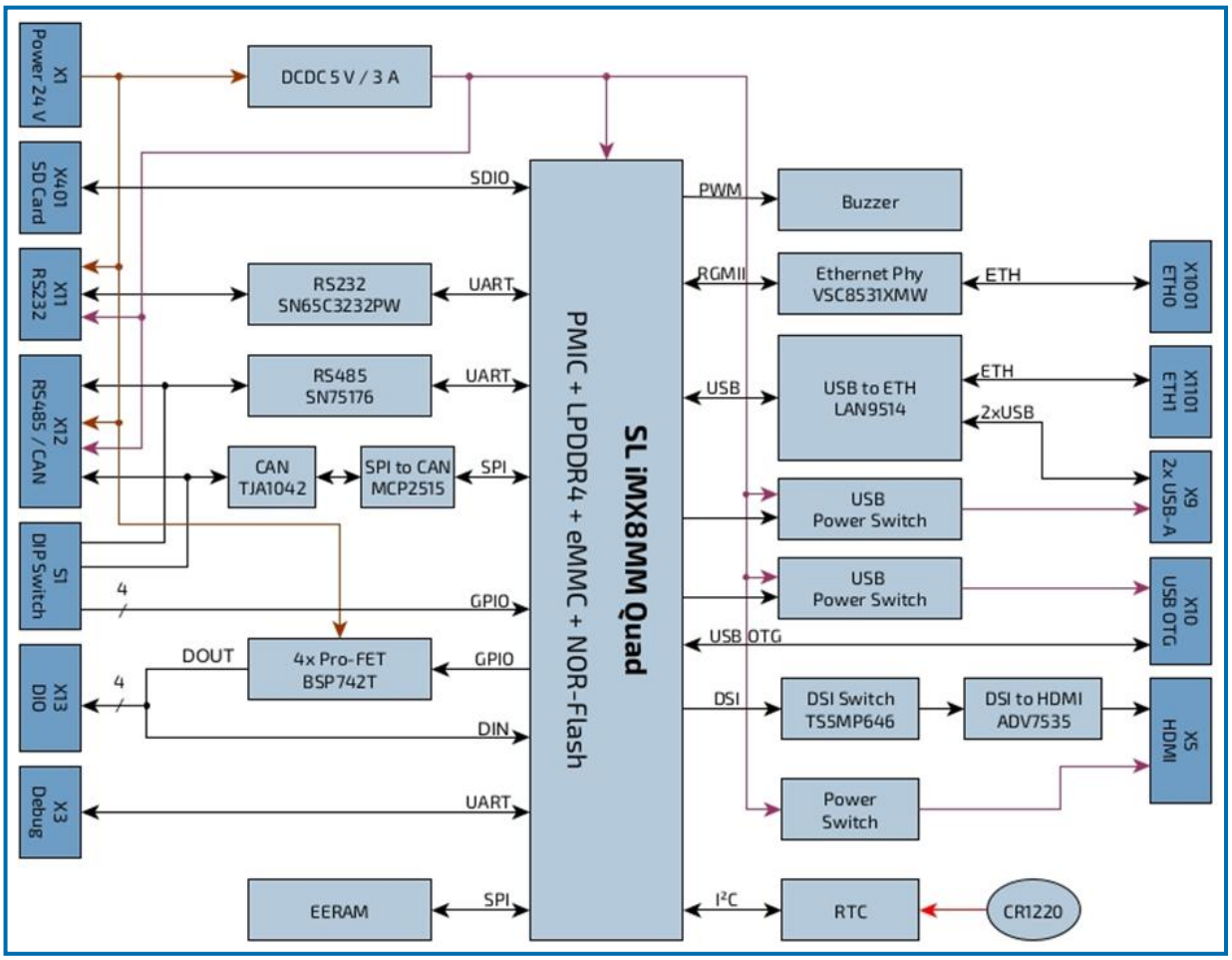


Figure 8: Block Diagram

9.7 Thermal Considerations

CAUTION hot Surface
There is a risk of injury from touching the heated housing. Danger of burns! Housing can get very hot. To avoid burns and personal Injury:
› Do not touch the housing 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.

The AL i.MX8M Mini is a fanless and passively cooled system. When mounting the AL i.MX8M Mini in a DIN rail enclosure or housing take care not to obstruct the airflow over the chassis, as this stops sufficient heat dispersing into the ambient environment and causes a build-up of heat.

Information
The maximum temperature range refers only to the limits of the individual components.

9.8 Standards, Certifications and Directives

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

Information
If the user modifies the product, prerequisites for specific approvals such as CE conformity declaration (safety requirements) may no longer apply.

Table 12: Standards, Certifications and Directives Compliance

CE-Mark Compliant with EU Directives	Electromagnetic Compatibility	Directive 2014/30/EU
	General Product Safety	Directive 2001/95/EG
	RoHS II	Directive 2011/65/EU + (EU)2015/863
EMC 2014/30/EU Immunity/Emission	EN 61000-6-2:2019	Electromagnetic compatibility (EMC), part 6-2: Generic Standards- Immunity for industrial environment
	EN 61000-6-3:2007+A1:2011	Electromagnetic compatibility (EMC), part 6-3: Generic Standards- Emission for industrial environment
Safety 2001/95/EG	EN 62368-1:2020+A11:2020	Audio/video, information and communication technology equipment - Part 1: Safety requirements

10 Connector Description

The front panel includes most of the I/O connectors.

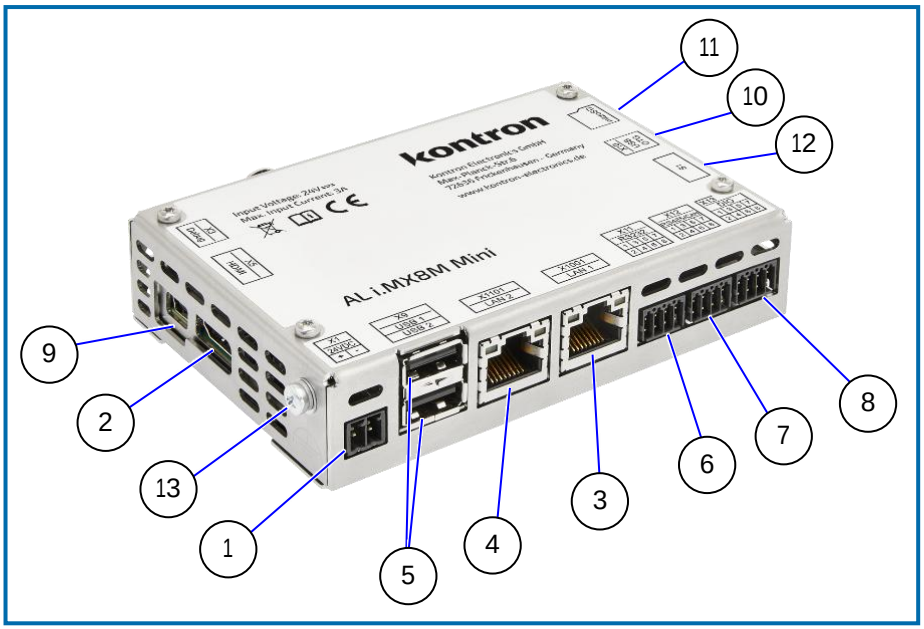


Figure 9: Top Side View

Table 13: Overview of all Connectors

Item	Label	Function	See Chapter
1	X1	DC Power Connector (2-pin Phoenix Contact)	10.2.1
2	X5	HDMI Connector	10.2.2
3	X1001	1 Gbit/s LAN1 RJ-45 Connector	10.2.3
4	X1101	10/100 Mbit/s LAN2 RJ-45 Connector	10.2.4
5	X9	USB2.0 Port 0 / 1 Connector (upper / lower)	10.2.5
6	X11	RS232 Connector	10.2.6
7	X12	RS485 / CAN Connector	10.2.7
8	X13	DIO Connector	10.2.9
9	X3	Debug UART Connector	10.2.10
10	X10	USB OTG Connector	10.2.11
11	X401	MicroSD Card Slot	10.2.12
12	S1	Switch CAN Address	10.2.8
13	FE	Functional Earth Connection	10.1.11

10.1 Connector Details

10.1.1 Power Connector

There is one 2-pin power connector supporting an input DC voltage range of 24 V DC ±20 %, see Figure 9 (pos. 1). The mating connector required to connect the power connector to a DC main power source is supplied with the AL i.MX8M Mini. For information on how to connect the supplied mating connector to the input power source, refer to Chapter 7.2: Wiring the DC Mating Power Connector.

For the pin assignment of the input power connector, refer to Chapter 10.2.1: Input Power Connector (X1).

10.1.2 HDMI Interface

There is one HDMI interface (1920 x 1080 pixel resolution), for video solutions, see Figure 9 (pos. 2). The HDMI interface is not designed for connecting cables longer than 3 m.

For the pin assignment of the HDMI connector, refer to Chapter 10.2.2: HDMI Connector (X5)

10.1.3 Ethernet (LAN2, LAN1) Interface

There are two LAN ports, see Figure 9 (pos. 3 and 4). In the software these are referred to as ETH0 and ETH1. The assignment between LAN2/LAN1 and ETH0/ETH1 depends on the software. In order to achieve the specified performance of the Ethernet port, shielded category 5 twisted pair cables must be used with 10/100 Mbit/s and Category 5E, 6 or 6E with 1 Gbit/s LAN networks. For the pin assignment of the RJ45 Ethernet connectors, refer to Chapter 10.2.3: Ethernet RJ45 Connector (X1001)

10.1.4 USB 2.0 Interface

There are two USB 2.0 ports allowing for the connection of USB 2.0 compatible devices, see Figure 9 (pos. 5). The USB ports are designed for connecting short cables only.

For the pin assignment of the USB 2.0 connector, refer to Chapter 10.2.5: USB Connector (X9)

10.1.5 RS232 Interface

There is a RS232 interface (RX/TX) supporting RTS/CTS, see Figure 9 (pos. 6). The RS232 interface is not designed for connecting cables longer than 3 m.

For the pin assignment of the RS232 connector, refer to Chapter 10.2.6: RS232 Connector (X11)

10.1.6 RS485 Interface

The RS485 interface in Figure 9 (pos. 7) contains also the wiring for CAN. The RS485 interface is not designed for connecting cables longer than 30 m.

For the pin assignment of the RS485/CAN connector, refer to Chapter 10.2.7: RS485/CAN Connector (X12)

10.1.7 CAN Interface

The CAN interface in Figure 9 (pos. 7) also contains the wiring for RS485. The CAN address switches 1...4 are connected directly to GPIO pins and can therefore also be used for other purposes. The CAN interface is not designed for connecting cables longer than 30 m.

For the pin assignment of the RS485/CAN connector, refer to Chapter 10.2.7: RS485/CAN Connector (X12)

10.1.8 DIO Interface

There is a four port DIO interface available on the front panel of the AL i.MX8M Mini, see Figure 9 (pos. 8).

The DIO pins consist of a 24 V high side switch, capable of driving 800 mA. The voltage level is according to the supply voltage. When the output is disabled, the pin can be used as 24 V input.

The DIO interface is not designed for connecting cables longer than 30 m.

For the pin assignment of the DIO connector, refer to Chapter 10.2.9: DIO Connector (X13)

10.1.9 USB OTG Interface

There is a Micro-USB OTG interface that can act as USB2.0 compatible device or host, see Figure 9 (pos. 10).

The USB OTG interface is for service and should only be used by qualified personnel.

For the pin assignment of the USB OTG connector, refer to Chapter 10.2.11: USB OTG Connector (X10)

10.1.10 MicroSD Card Slot

There is a card slot to connect a microSD card for extra memory, see Figure 9 (pos. 11).

For the pin assignment of the microSD card slot, refer to Chapter 10.2.12: MicroSD Card Slot

10.1.11 Functional Earth Connection

There is a functional earth self-clinching nut on the side of the housing connected to the electronic ground inside the system and to the mounting clamp on the backside of the housing, see Figure 9 (pos. 13).

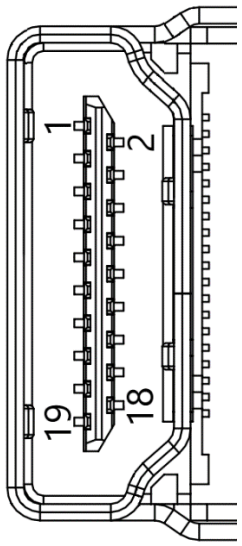
10.2 Connector Pin Assignments

10.2.1 Input Power Connector (X1)

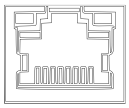
2-Pin Power Mating Connector	Pin	Signal Name
	1	VCC
	2	GND

Phoenix Contact Connector 180° FMC 1,5/2-ST-3,5 (Phoenix 1826680)

10.2.2 HDMI Connector (X5)

HDMI	Pin	Signal Name
	1	TMDS Data2+
	2	GND
	3	TMDS Data2-
	4	TMDS Data1+
	5	GND
	6	TMDS Data1-
	7	TMDS Data0+
	8	GND
	9	TMDS Data0-
	10	TMDS Clock+
	11	GND
	12	TMDS Clock-
	13	Reserved
	14	Reserved
	15	DDC_CLK
	16	DDC_DATA
	17	GND
	18	+5 V Power
	19	Hot Plug Detect

10.2.3 Ethernet RJ45 Connector (X1001)

RJ45 (female)	Pin	Signal Name	Pin	Signal Name
	1	TX0+	5	TX2-
	2	TX0-	6	TX1-
	3	TX1+	7	TX3+
	4	TX2+	8	TX3-

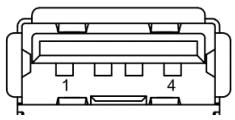
Left LED: Activity / Link		Right LED: Activity 10/100/1000	
Off	10 Mbit/s	Off	No LAN connectivity
Green	100 Mbit/s, 1000 Mbit/s	Yellow	Link
		Blinking	Activity

10.2.4 Ethernet RJ45 Connector (X1101)

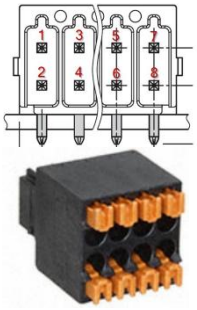
RJ45 (female)	Pin	Signal Name	Pin	Signal Name
	1	TX+	5	n.c.
	2	TX-	6	RX-
	3	RX+	7	n.c.
	4	n.c.	8	n.c.

Left LED: Activity / Link		Right LED: Activity 10/100	
Off	10 Mbit/s	Off	No LAN connectivity
Green	100 Mbit/s	Yellow	Link
		Blinking	Activity

10.2.5 USB Connector (X9)

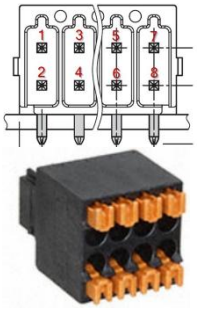
2x USB A 2.0	Pin	Signal Name
	1	+USB_VCC
	2	D-
	3	D+
	4	GND

10.2.6 RS232 Connector (X11)

RS232 Interface	Pin	RS232
	1	VIN
	2	GND
	3	TxD
	4	RxD
	5	RTS
	6	CTS
	7	+5 V DC
	8	GND

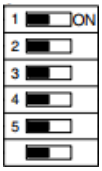
Phoenix Contact Connector 180° DFMC 0,5/4-ST-2,54 (Phoenix 1844594)

10.2.7 RS485/CAN Connector (X12)

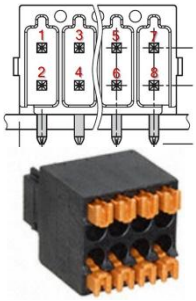
RS485/CAN Interface	Pin	Signal Name
	1	VIN
	2	GND
	3	RS485 A
	4	CAN H
	5	RS485 B
	6	CAN L
	7	+5 V DC
	8	GND

Phoenix Contact Connector 180° DFMC 0,5/4-ST-2,54 (Phoenix 1844594)

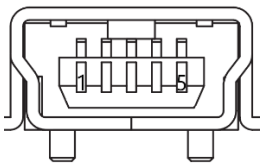
10.2.8 CAN Address and Termination Switch (S1)

CAN Address	Switch	Signal Name
	1	Address 1
	2	Address 2
	3	Address 3
	4	Address 4
	5	CAN Termination (121 Ω)
	6	RS485 Termination (121 Ω)

10.2.9 DIO Connector (X13)

DIO Interface	Pin	Signal Name	Pin	Signal Name
	1	DOUT1 / DIN1 DOUT Imax = 800 mA	2	GND
	3	DOUT2 / DIN2 DOUT Imax = 800 mA	4	GND
	5	DOUT3 / DIN3 DOUT Imax = 800 mA	6	GND
	7	DOUT4 / DIN4 DOUT Imax = 800 mA	8	GND

10.2.10 USB Debug Connector (X3)

Mini-B USB Connector	Pin	Signal Name
	1	VCC
	2	RXD
	3	TXD
	4	N.C.
	5	GND

An additional adapter is needed to translate the UART signals provided on the Mini-B USB connector to USB. This adapter must be connected between an USB port on your computer and the debug interface on the AL i.MX8M Mini using a standard USB cable.

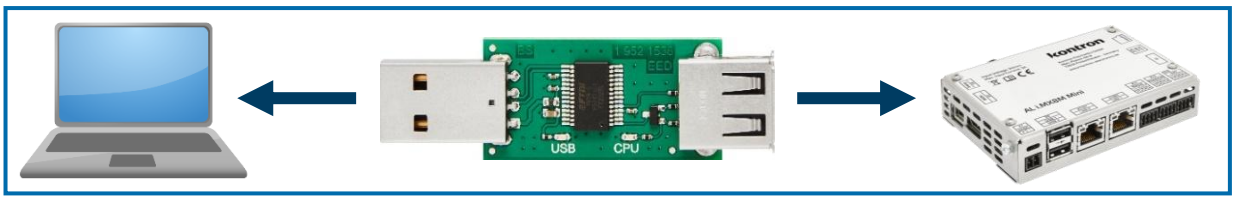


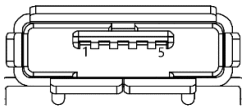
Figure 10: USB-UART Debug-Adapter

This adapter is only supplied as standard with our development kits but can also be ordered separately.

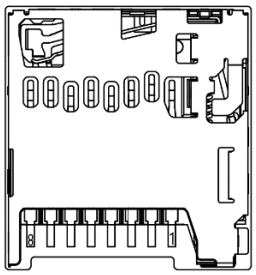
For more detailed information please have a look at the online documentation https://docs.kontron-electronics.de.

This documentation includes all information you need to put your device into operation including a quick start guide as well as further information on how to get access to the Yocto based GitLab software repository and how to make your own software images.

10.2.11 USB OTG Connector (X10)

Micro-USB Connector	Pin	Signal Name
	1	+USB_VCC
	2	D-
	3	D+
	4	ID
	5	GND

10.2.12 MicroSD Card Slot

MicroSD Card	Pin	Signal Name
	1	DTA2
	2	CD/DAT3
	3	CMD
	4	VDD
	5	CLK
	6	VSS
	7	DAT0
	8	DAT1

Information

Pay attention to the manufacturer's lifespan specification. Due to the limited lifespan of SD-Cards/SSD drives Kontron Electronics recommends checking the condition regularly.

11 Accessing Components

This chapter contains important information that users must read before accessing components. Follow these procedures properly when accessing or installing component to extend the system.

NOTICE

The AL i.MX8M Mini is factory configured to meet customer requirements. Kontron Electronics does not recommend opening the system as this may cause damage to internal components. There is a protection label on the AL i.MX8M Mini.

If the product is opened within the warranty period, the warranty is lost.

ESD Sensitive Device

Follow the safety instructions for components that are sensitive to electrostatic discharge (ESD). Failure to observe this warning notice may result in damage to the product or/and internal components

Information

Because of the limited predetermined lifespan of expansion devices, Kontron Electronics recommends checking the condition of installed expansion devices regularly and to pay attention to the manufacturer specifications for lifespan.

11.1 MicroSD Card Slot

The AL i.MX8M Mini supports a removable microSD card.

To remove/install a removable microSD card, perform the following steps:

- Press the microSD card on the right-hand side of the AL i.MX8M Mini to remove a microSD card out of the slot.
- The microSD card automatically slides out a bit for removal.
- Slide in the microSD card, if needed. Take care of the correct position.

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 open product may only be carried out by qualified personnel authorized by Kontron Electronics.

Cleaning:

- For light soiling, clean the product with a dry cloth.
- Carefully remove dust from the surface of the chassis and cooling fins (if present) using a clean, soft brush.
- Stubborn dirt should be removed using a mild detergent and a soft cloth.

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

WARNING
Keep the device dry. Exposure to water may cause damage to the device and pose a risk to the user.

12.4 Replacing the Coin Battery

The coin battery (CR1220) must only be replaced with the same type of battery or with a type of battery recommended by Kontron Electronics. If the on-board Lithium battery needs to be replaced, follow the steps below:

- Remove the lithium battery from the holder by pulling it outwards.
- Place a new lithium battery in the battery holder.
- Pay attention to the polarity of the battery.

WARNING

Risk of explosion if the battery is not replaced in accordance with the instructions! (short circuit, reverse polarity, wrong type of battery) Dispose of used batteries in accordance with the manufacturer's instructions.

NOTICE

Do not dispose of coin batteries in general trash collection. Dispose of the battery according to the local regulations dealing with the disposal of these special materials, (e.g. to the collecting points for dispose of batteries).

13 Technical Support

13.1 First Steps – Startup Information

For the first startup the AL 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: 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 AL 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 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

NOTICE

The AL i.MX8M Mini is factory configured to meet customer requirements. Kontron Electronics does not recommend opening the system as this may cause damage to internal components. There is a protection label on the AL i.MX8M Mini.

If the product is opened within the warranty period, the warranty is lost.

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 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 14: 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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