BL Pi-Tron CM4

Doc. Rev 3.0

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Demo software

If the product is delivered with demo software, this software is intended for testing purposes only and is not permitted for real use!

Revision History

Table 1: Revision History

Revision	Brief Description of Changes	Date of Issue	Author/Editor
Rev. 0.1	Initial draft version	17.07.2025	Tur
Rev. 1.0	Final Release	20.05.2026	Wb
Rev. 1.1	Change of device certification. Minor corrections and additions	2024-03-20	Tur + Wb
Rev. 2.0	Final release	2024-11-27	Wb
Rev. 2.1	DOUT Current Limitation, Update Table 11	2026-05-04	Tur + Wb
Rev. 3.0	New design and layout	2026-07-15	Tur + Wb

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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).
- AL and DL series products should only be opened to replace a depleted coin cell 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.

Additional safety information for BL

Please note when extending the device:

- When installing additional modules, ensure that the workspace is clean.
- After installing the additional modules, please check the product for any damage.
- The power consumption of each additional module must not exceed the specified limit.
- Structural changes and modifications must be approved by Kontron Electronics. Unauthorised structural modifications and conversions will result in the loss of any warranty.
- Only trained personnel are authorised to handle and operate the device.

Additional safety instructions for the Development Kit

- Regularly check the unit's components, accessories and power supply for damage.
- Only trained personnel are authorised to handle and operate the appliance.
- The product is a customised, application-specific test module intended for exclusive use by experts in research and development facilities for research and development purposes. (§2 section 3 paragraph 3 EMVG)

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 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.

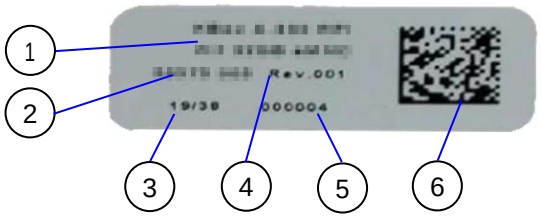
5.3 Scope of Delivery

Included in this delivery:

- BL Pi-Tron CM4
- Safety Instructions
- DC Power Connector (2-pin Phoenix Contact)

5.4 Label and Product Identification

Table 2: BL Pi-Tron CM4 Label



Detail	Description
1	Product name (BL Pi-Tron CM4)
2	Article number
3	Production date
4	Revision number
5	Serial number
6	Data-Matrix-Code with article-, rev., date and serial number

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 BL Pi-Tron CM4. The BL Pi-Tron CM4 is a flexible single board computer fanless device designed for use in demanding applications. Based on the CM4 Broadcom BCM2711 (4x Arm® Cortex®-A72, ARM v8) quad core processor, the BL Pi-Tron CM4 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.

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 Raspberry Pi software. Latest revision of this user guide and datasheet can be downloaded from Kontron Electronics Web Page. The Raspberry Pi software can be downloaded directly from Raspberry Pi.

Kontron Electronics' BL Pi-Tron CM4 is developed specifically for easy entry into the world of professional industrial controls, with a wide range of interfaces and for use when space is limited. The fanless design ensures a significantly prolonged lifespan and high system availability.

Exploring the BL Pi-Tron CM4

Before working with the BL Pi-Tron CM4, Kontron Electronics recommends that users take a few minutes to learn about the various parts of the BL Pi-Tron CM4.

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 BL Pi-Tron CM4 connects to a DC main power supply via a Phoenix Contact input power connector and corresponding power cable.

Information

When starting the BL Pi-Tron CM4, Kontron Electronics recommends that the power cable should be the last connection made to the system. Following the proper cabling sequence helps prevent false power-on conditions, which could otherwise lead to operational failures.

CAUTION

Please make sure to read the safety instructions at the beginning of this user guide before connecting the BL Pi-Tron CM4 to a power supply.

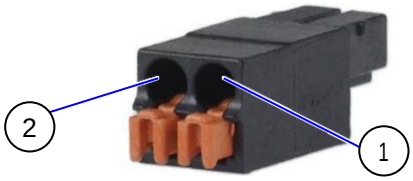
WARNING

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

7.2 Wiring the DC Mating Power Connector

The BL Pi-Tron CM4 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

WARNING

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

Information

The wires used for power connections must be clearly marked (+/ -) to ensure proper connection to the 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 Operating System (OS) and Drivers

The standard BL Pi-Tron CM4 is supplied *without* pre-installed OS. Guides to setup an OS and further information about the various interfaces of the BL Pi-Tron CM4 are available from Kontron Electronics' online documentation at:

https://docs.kontron-electronics.de/sw/ked/docs/docs/guides-and-examples/pi-tron-cm4/quickstart/

Demo software

If the product is delivered with demo software, this software is intended for testing purposes only and is not permitted for real use!

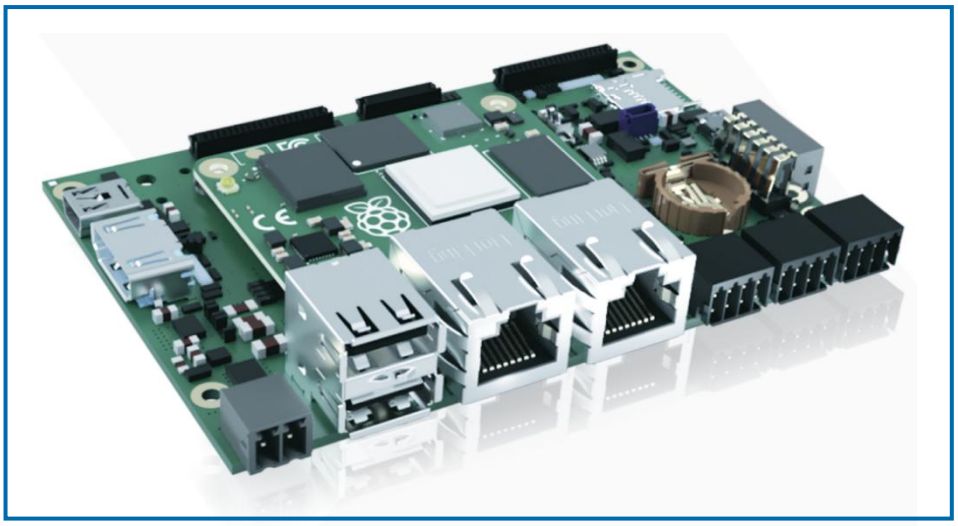
8 Product Overview

The BL Pi-Tron CM4 is a flexible single board computer fanless device designed for use in demanding applications. Based on the CM4 Broadcom BCM2711 (4x Arm® Cortex®-A72) quad core processor, the BL Pi-Tron CM4 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.

All variants are also available as a separate product named Automation-Line AL Pi-Tron CM4 in a robust steel chassis, designed for operation in a DIN rail environment using a vertical orientation.

Please contact us for detailed information or visit: https://www.kontron-electronics.com/

Figure 1: BL Pi-Tron CM4



8.1 Main Characteristics

Main characteristics of the BL Pi-Tron CM4 are:

- Broadcom BCM2711 quad-core Cortex-A72, 64-bit SoC @ 1.5GHz
- 1 Gbyte up to 8 GByte LPDDR4 RAM
- 8 GByte up to 32 GByte eMMC
- 4 kByte (32 kbit) EEPROM
- External microSD card slot
- Interfaces: 1x HDMI, 1x 10/100 Mbit/s Ethernet, 1x Gbit/s Ethernet, 2x USB 2.0 Host, 1x USB OTG (only for programming eMMC), 1x RS232, 1x RS485, 1x CAN FD, 4x DIO, 1x MIPI (CSI/DSI), 1x 40-pin RPI-GPIO-Header, 1x Debug Interface, 1x Fan Connector, 1x Qwiic (I^2C), M.2 B-Key
- Fanless passive cooling (heatsink required)

The BL Pi-Tron CM4 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 BL Pi-Tron CM4

Board	Description	Product Number
BL Pi-Tron CM4 1GB/8GB eMMC	Board Line with Raspberry Pi Compute Module 4 quad core processor, 1 GB LPDDR4 RAM and 8 GB eMMC onboard storage, without WLAN	40099 250
BL Pi-Tron CM4 2GB/Lite	Board Line with Raspberry Pi Compute Module 4 quad core processor, Lite module, 2 GB LPDDR4 RAM with no eMMC and without WLAN	40099 249
BL Pi-Tron CM4 2GB/16GB eMMC	Board Line with Raspberry Pi Compute Module 4 quad core processor, 2 GB LPDDR4 RAM and 16 GB eMMC onboard storage, without WLAN	40099 302
BL Pi-Tron CM4 2GB/16GB eMMC	Board Line with Raspberry Pi Compute Module 4 quad core processor, 2 GB LPDDR4 RAM and 16 GB eMMC onboard storage, without WLAN and with heatsink	40099 279
BL Pi-Tron CM4 2GB/16GB eMMC	Board Line with Raspberry Pi Compute Module 4 quad core processor, 2 GB LPDDR4 RAM and 16 GB eMMC onboard storage, with WLAN Antenna Kit	40099 252
BL Pi-Tron CM4 4GB/32GB eMMC	Board Line with Raspberry Pi Compute Module 4 quad core processor, 4 GB LPDDR4 RAM and 32 GB eMMC onboard storage, with WLAN Antenna Kit	40099 287
BL Pi-Tron CM4 8GB/32GB eMMC	Board Line with Raspberry Pi Compute Module 4 quad core processor, 8 GB LPDDR4 RAM and 32 GB eMMC onboard storage, with WLAN Antenna Kit	40099 251
Other systems on request		

8.3 Related Products and Accessories

The following products are available with the CM4:

- BL Pi-Tron CM4 (Board Line, including mounted Compute Module 4)
- AL Pi-Tron CM4 (Automation Line, including BL Pi-Tron CM4 + stainless steel Housing)
- DL 7" Pi-Tron CM4 (Display Line, including BL Pi-Tron CM4 + Touch-Display + Housing)
- Other systems on request

Table 5: Accessories for BL Pi-Tron CM4

Item	Description	Product Number
SD Card	MicroSD Card 16 GB	1 060 0338
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 Mini-B USB connector to USB for connecting the BL Pi-Tron CM4 to a computer	40099 101
USB-Cable	Connects the Mini-B Debug connector of the BL Pi-Tron CM4 to the USB-A of the Debug-Adapter	1 860 1154

9 System Specification

9.1 Technical Specification

The BL Pi-Tron CM4 implements the following technical specification.

Table 6: Technical Specification

Processor	› Broadcom BCM2711 4x Arm® Cortex®-A72, 64-bit SoC @1,5 GHz › 4Kp60 HEVC decoder › OpenGL ES 3.1 graphics, Vulkan 1.0
System Memory	› LPDDR4-RAM 1 GB up to 8 GB
Storage	› 0 GB (Lite-Version with SD-Card Interface), 8 GB eMMC up to 32 GB › EEPROM 4 kByte (32 kbit)
Interfaces	› 2x USB 2.0, USB A › 1x USB OTG, Micro-USB › 1x 1 Gbit/s Ethernet › 1x 10/100 Mbit/s Ethernet › 1x HDMI › 1x RS232 › 1x RS485 › 1x CAN 2.0B / FD › 4x DIO › 1x Debug (UART) › 1x Fan › 1x MIPI (CSI/DSI) (Kontron OEM use only) › Family HDMI Connector (Kontron OEM use only) › 1x 40-pin RPI-GPIO-Header › 1x M.2 B-Key 3042 › 1x Nano SIM › 1x Qwiic (I^2C)
Optional Interfaces	› WLAN (2,4 GHz, 5,0 GHz IEEE 802.11 b/g/n/ac) › Bluetooth 5.0 with BLE
Expansion Sockets	› 1x external MicroSD Card Slot
Power	› 24 V DC ±20 % Input
Other Features	› RTC with battery
Operating System (OS)	› Raspberry Pi OS, Yocto, Ubuntu and others › Documentation and support: https://docs.kontron-electronics.de

Demo software

If the product is delivered with demo software, this software is intended for testing purposes only and is not permitted for real use!

9.2 Environmental Specification

Table 7: Environmental Conditions

Temperature (Operating)	0°C...55 °C ambient, non-condensing. Other temperature ranges on request.
Temperature (Storage)	-20...70 °C ambient, non-condensing
Pollution	Degree II

Cooling
The BL Pi-Tron CM4 is designed for operation in a customer-specific enclosure or device. Please do not operate the BL Pi-Tron CM4 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.

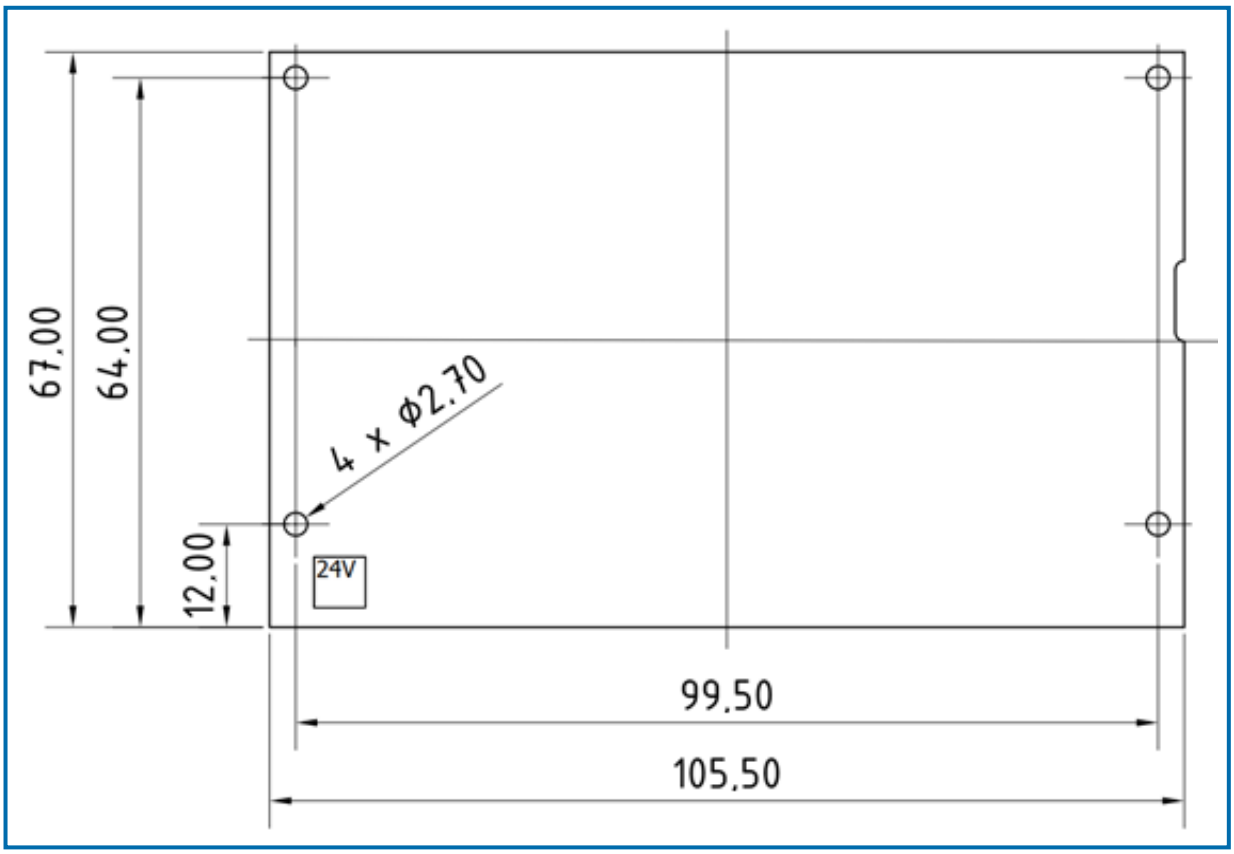
9.3 Mechanical Specification

Table 8: Mechanical Specification

Dimension	BL Pi-Tron CM4 (Form Factor 4,3")
Width	105,5 mm (4,15")
Depth	67 mm (2,64")
Height	24 mm (0,94")
Weight	81 g (0,18 lbs.)
Mounting	Screw mounting (M2.5)

Refer to the following outline dimensions drawing for more detailed mechanical information, including the position and size of the mounting holes. All dimensions are in millimetres.

Figure 2: Board Dimensions



9.4 Power Specification

The BL Pi-Tron CM4 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.

WARNING

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

NOTICE

Performing a forced shutdown can lead to loss of data!

Table 9: Power Specification

Nominal Input Voltage	24 V DC
Input Voltage Range	24 V DC ±20 %
Input Power	Max. 72 W (including connected peripherals)
Output Current 3.3 V	max. 3 A
Output Current 5 V	max. 3 A
Output Current 24V: 4x DOUT, total	max. 2 A
Input Power Mating Connector	2-pin Phoenix Contact 180° FMC 1,5/2-ST-3,5 (1826680)

NOTICE

The maximum output current of all outputs together is divided between the 5 V and 3 V paths. The maximum output currents for 5 V and 3 V shown in Table 9 refer to the use of that voltage only and are reduced accordingly when both voltages are used.

Information

The CR2032 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 BL Pi-Tron CM4 varies depending on the installed components and external peripherals, for more information see the following figure and table.

Figure 3: Power Tree

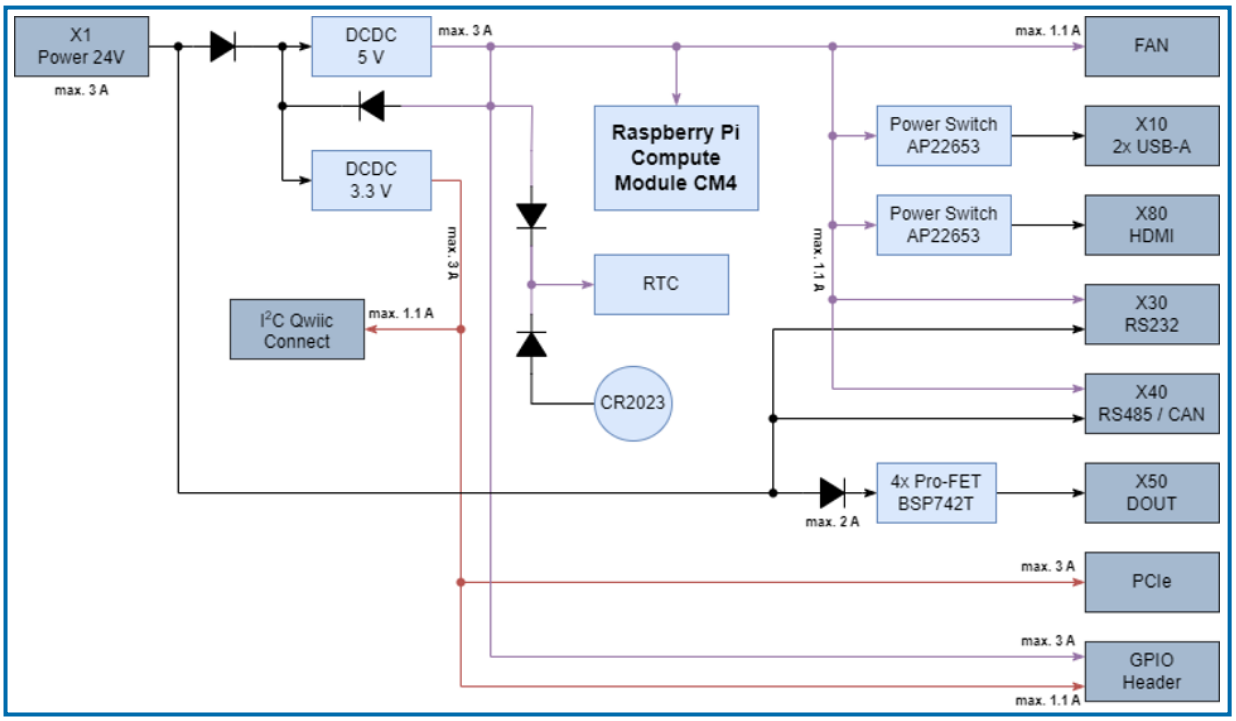


Table 10: Power Consumption

Power Figures SBC	BL Pi-Tron CM4
BL Pi-Tron CM4 Deep Sleep Mode	not supported
BL Pi-Tron CM4 idle	3 W
BL Pi-Tron CM4 run	3...11 W
1x HDMI (typ.)	50 mA * 5 V = 250 mW
LAN 1	1 W
LAN 2	1 W
2x USB 2.0	2x 5 V * 500 mA = 5,5 W
4x DOUT	4x 0.5 A * 24 V = 48 W

BL Pi-Tron CM4 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 Compute Module 4 Power Consumption in the datasheet for further information.

NOTICE

Although each DOUT can source up to 800 mA of current, restrictions apply to their combined usage, as seen in the following table.

Table 11: Digital Output Current

Digital Output Combination used	Maximum Current per Channel
Only one DOUT	800 mA
DOUT**1** + DOUT**2**	
DOUT**3** + DOUT**4**	
DOUT**1** + DOUT**3**	500 mA
DOUT**2** + DOUT**4**	
Three or more DOUTs	

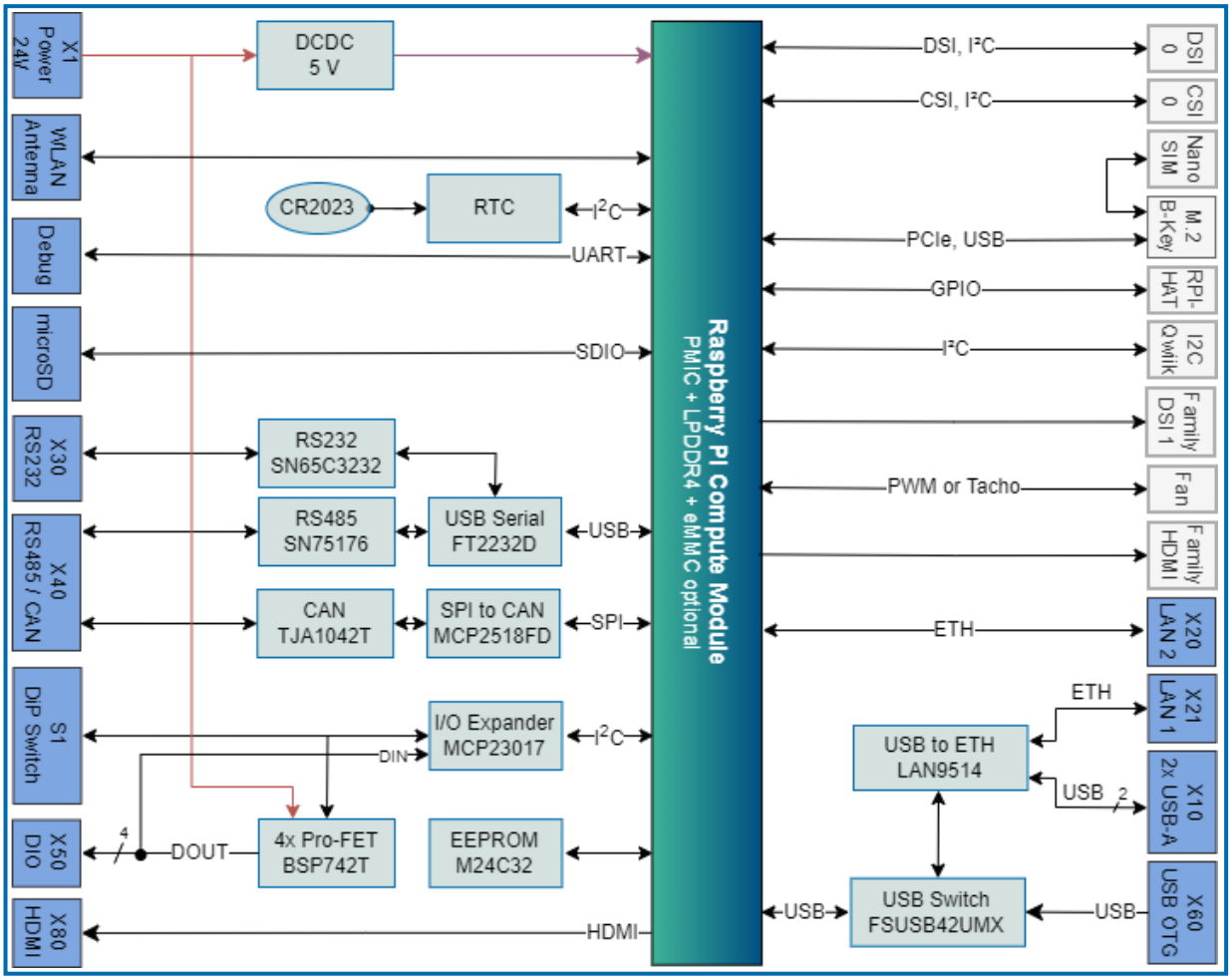
9.5 Earthing System

A functional earth connection to the board will be possible via the four mounting holes. These contact surfaces are directly attached to the electronic ground and the GND pin of the power connector.

9.6 Functional Block Diagram

The following diagram highlights the interfaces shown in blue, which are positioned along three edges of the board to allow easy access when mounted in an enclosure.

Figure 4: Block Diagram



9.7 Thermal Considerations

CAUTION hot Surface
There is a risk of injury from touching heated components or the board.
› Do not touch the board 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 BL Pi-Tron CM4 is a fanless and passively cooled system. When mounting the BL Pi-Tron CM4 in a housing take care not to obstruct the airflow over the components, as this stops sufficient heat dispersing into the ambient environment and causes a build-up of heat.

Information
The BL Pi-Tron CM4 is designed for operation in a customer-specific enclosure or device. Please do not operate the BL Pi-Tron CM4 without sufficient cooling system. The maximum temperature range refers only to the limits of the individual components.

9.8 Standards, Certifications and Directives

The BL Pi-Tron CM4 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	RED Directive	Directive 2014/53/EU
	Product Safety Policy	Directive 2001/95/EG
	RoHS Directive	Directive 2011/65/EU + (EU)2015/863
RED Directive 2014/53/EU	ETSI EN 301 489-1 V2.2.3 (2019-11)	ElectroMagnetic Compatibility (EMC) standard for radio equipment and services; Part 1: Common technical requirements;
	ETSI EN 301 489-17 V3.2.4 (2020-09)	ElectroMagnetic Compatibility (EMC) standard for radio equipment and services - Part 17: Specific conditions for Broadband Data Transmission Systems
	ETSI EN 300 328 V2.2.2: 2019	Wideband transmission systems - Data transmission equipment operating in the 2,4 GHz band - Harmonised Standard for access to radio spectrum
	ETSI EN 301 893 V2.1.1: 2017	5 GHz RLAN - Harmonised Standard covering the essential requirements of article 3.2 of Directive 2014/53/EU
Product Safety Policy 2001/95/EG	EN 62368-1:2020+A11:2020	Audio/video, information and communication technology equipment - Part 1: Safety requirements
EMC	EN IEC 61000-6-3:2021	Electromagnetic compatibility (EMC) - Part 6-3: Generic standards - Emission standard for equipment in residential environments
	EN IEC 61000-6-2:2019	Electromagnetic compatibility (EMC) - Part 6-2: Generic standards - Immunity standard for industrial environments

10 Board and Connectors

Figure 5: Top Side View

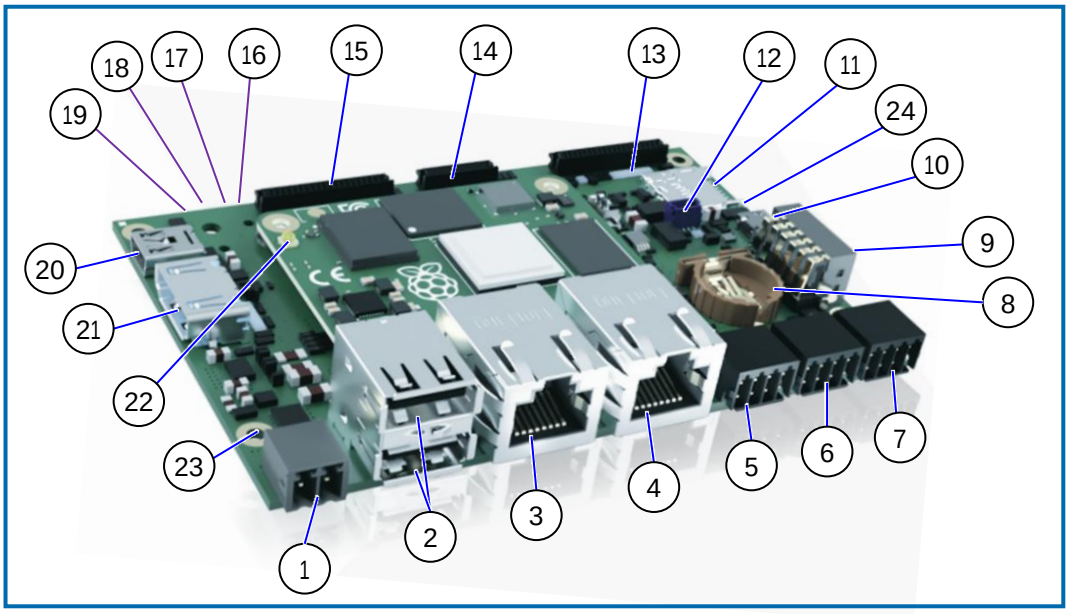


Table 13: Overview of Components and Connectors

Item	Label	Function	See Chapter
1	X1	DC Power Connector (2-pin Phoenix Contact)	10.1.1
2	X10	USB 2.0 Port 0 / 1 Connector (upper / lower)	10.1.2
3	X20	1 Gbit/s LAN2 RJ-45 Connector	10.1.3
4	X21	10/100 Mbit/s LAN1 RJ-45 Connector	10.1.3
5	X30	RS232 Connector	10.1.4
6	X40	RS485 / CAN Connector	10.1.5
7	X50	DIO Connector	10.1.7
8	X3	Battery connector for RTC	10.1.8
9	S1	Switch CAN Address	10.1.9
10	X60	USB OTG Connector (only for programming eMMC)	10.1.10
11	X190	MicroSD Card Slot	10.1.11
12	X181	Fan Connector	10.1.12
13	X161	Family HDMI Connector (Kontron OEM use only)	10.1.13
14	X160	DSI0 Connector (Display Serial Interface)	10.1.14
15	X162	Family DSI1 (Display Serial Interface, Kontron OEM use only)	10.1.15
16	X170	CSI0 Connector (Camera Serial Interface, bottom side)	10.1.16
17	X180	40-pin RPI-GPIO-Header (bottom side)	10.1.17
18	X182	M.2 slot (bottom side)	10.1.18
19	X191	Nano SIM card slot (bottom side)	10.1.19
20	X70	Debug Connector	10.1.20
21	X80	HDMI Connector	10.1.21
22	x	WLAN Antenna Connector	10.1.22
23	FE	Functional Earth Connection	10.1.23
24	X183	Qwiik Connector	10.1.24

10.1 Interface Details

10.1.1 Power Connector

There is one 2-pin power connector on the top side of the board supporting an input DC voltage range of 24 V DC ±20 %, see Figure 5 (pos. 1). The mating connector required to connect the power connector to a DC main power source is supplied with the BL Pi-Tron CM4. 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 (X3).

10.1.2 USB 2.0 Interface

There are two USB 2.0 ports allowing for the connection of USB 2.0 compatible devices, see Figure 5 (pos. 2). The USB ports are designed for connecting short cables only.

For the pin assignment of the USB 2.0 connector, refer to Chapter 10.2.2: USB Connector (X10)

10.1.3 Ethernet (LAN2, LAN1) Interface

There are two LAN ports, see Figure 5 (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 ports (1 Gbit/s), shielded category 5E, 6 or 6E twisted pair cables must be used.

Note: The LAN2 port is connected directly to the CM4 ethernet, whereas LAN1 is connected to a 10/100 Mbit/s USB-Ethernet controller.

For the pin assignment of the RJ45 Ethernet connectors, refer to Chapters 10.2.3 Ethernet RJ45 Connector (X20) and 10.2.4 Ethernet RJ45 Connector (X21).

10.1.4 RS232 Interface

There is a RS232 interface (RX/TX) supporting RTS/CTS (USB FTDI 2232D), see Figure 5 (pos. 5). The RS232 interface is not designed for connecting cables longer than 3 m.

For the pin assignment of the RS232 connector, refer to Chapter 10.2.5: RS232 Connector (X30)

10.1.5 RS485 Interface

The RS485 interface in Figure 5 (pos. 6) 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 10.2.6: RS485/CAN Connector (X40)

10.1.6 CAN Interface

The CAN interface in Figure 5 (pos. 6) 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 10.2.6: RS485/CAN Connector (X40)

10.1.7 DIO Interface

There is a four port DIO interface available on the front of the BL Pi-Tron CM4, see Figure 5 (pos. 7).

Each DIO pin consists of a 24 V high-side switch capable of sourcing up to 800 mA. However, the total current for all DIO pins must not exceed 2,5 A. For more details on the DOUT current capability, refer to Table 11: Digital Output Current. 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 10.2.7: DIO Connector (X50)

10.1.8 Battery Connector for RTC

The BL Pi-Tron CM4 offers a 2-pin battery connector, to connect a 2-wire cabled battery as a backup power source for the onboard RTC. The battery is already inserted in the standard scope of delivery.

For the pin assignment of the battery connector, refer to Chapter 10.2.8 Battery connector for RTC (X3).

10.1.9 Switch CAN Address

The CAN address switches are intended to be used for the CAN Bus and allow for an external user node id selection if the Pi-Tron CM4 is used as a CAN slave device. However, the address switches 1...4 are connected directly to common GPIO pins and can therefore also be used for other purposes.

For the dip switch assignment of the CAN address switches, refer to Chapter 10.2.9 CAN Address and Termination Switch (S1).

10.1.10 USB OTG Interface

There is a Micro-USB OTG interface for programming the eMMC or microSD card, see Figure 5 (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 10.2.10 USB OTG Connector (X60).

10.1.11 MicroSD Card Slot

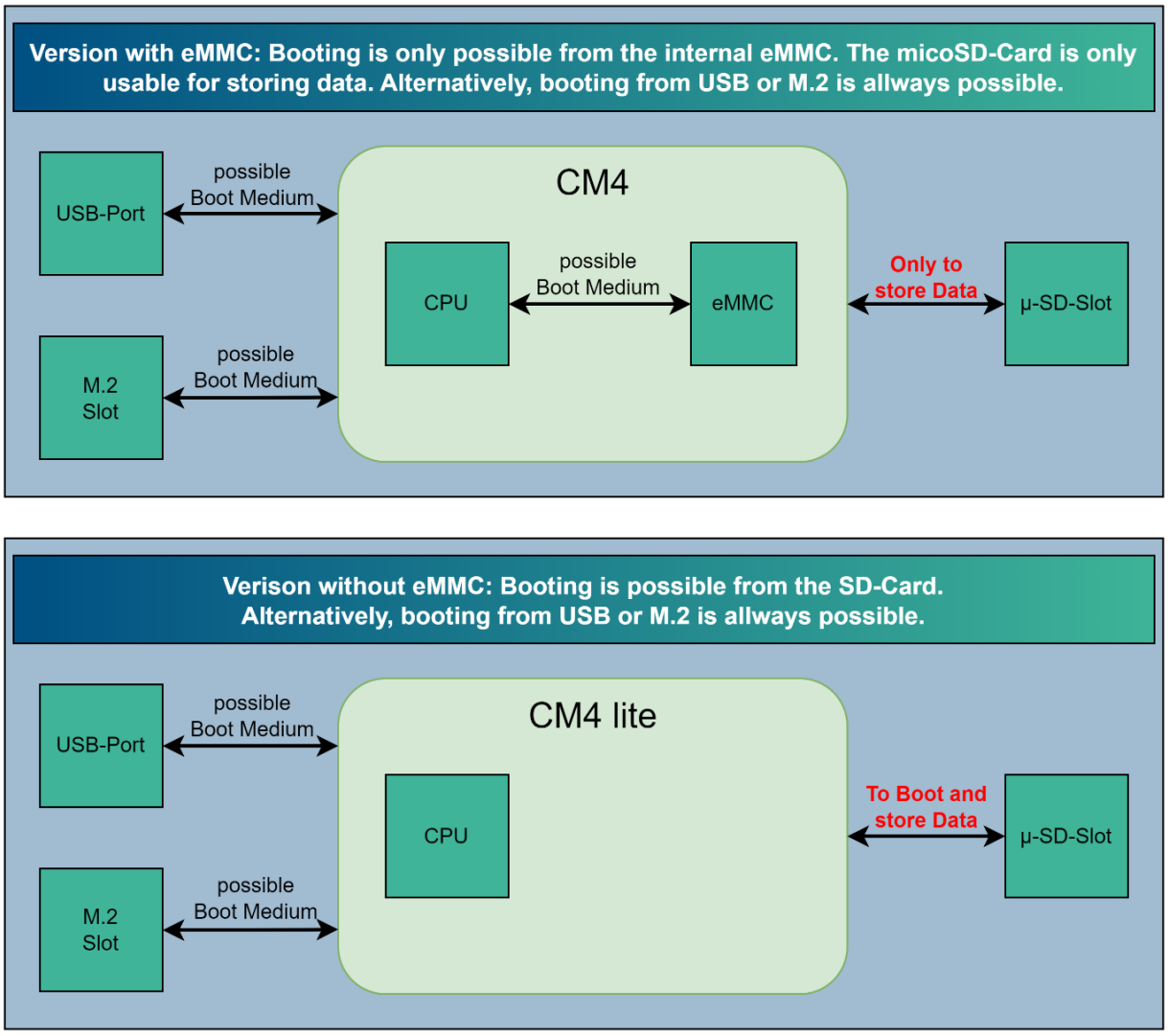
There is a card slot to connect a microSD card for extra memory, see Figure 5 (pos. 11).

When using eMMC, the SD card can be activated via a software switch to be used as data storage. Refer to the online help of the Pi-Tron CM4 for a detailed step by step guide to use the SD card alongside eMMC. If a CM4 Lite module is installed, the microSD card slot serves a boot device, as there is no eMMC present.

For the pin assignment of the microSD card slot, refer to Chapter 10.2.11: MicroSD Card Slot (X190)
For information on how to insert the microSD card slot, refer to Chapter 11.1: MicroSD Card Slot

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.

Figure 6: Boot Options



10.1.12 Fan Connector

There is a fan connector to control a 5 V fan via GPIO 12 (PWM), see Figure 5 (pos. 12). For the pin assignment of the fan connector, refer to Chapter 10.2.12 Fan Connector (X181).

10.1.13 Family HDMI Connector (Kontron OEM use only)

There is an LVDS/HDMI interface to connect an LVDS/HDMI display via a ribbon cable, see Figure 5 (pos. 13). This connector is intended to be used with Kontron OEM displays.

For the pin assignment of the LVDS/HDMI connector, refer to Chapter10.2.13 Family HDMI Connector (Kontron OEM use only, X161).

10.1.14 DSI0 (Display Serial Interface)

There is a DSI interface to connect a Raspberry Pi compatible display, see Figure 5 (pos. 14). For the pin assignment of the DSI0 connector, refer to Chapter 10.2.14 DSI0 Connector (Display Serial Interface, X160).

10.1.15 Family DSI1 (Display Serial Interface, Kontron OEM use only)

There is a second DSI interface (DSI1) to connect Kontron specific DSI displays, see Figure 5 (pos. 15). For the pin assignment of the DSI1 connector, refer to chapter 3.2.15 Family DSI1 Connector (Display Serial Interface, Kontron OEM use only, X162).

10.1.16 CSI0 (Camera Serial Interface)

There is a CSI interface to connect a Raspberry Pi compatible camera, see Figure 5 (pos. 16). For the pin assignment of the CSI connector, refer to chapter 3.2.16 CSI0 Connector (Camera Serial Interface, X170).

10.1.17 40-pin RPI-GPIO-Header

The BL Pi-Tron CM4 can be fitted with a 40-pin GPIO header on the bottom side of the PCB. By default, the BL Pi-Tron CM4 comes without a soldered header. The 40-pin header has the same pin layout as the Raspberry Pi 4 and can be used in the same way. See Figure 5 (pos. 17).

Note: Not all GPIOs of the 40-pin header can be used if other onboard functions, like the CAN Bus, are used. The CAN Bus is connected to SPI0 and therefor SPI0 cannot be used for anything else. This means some of the pins (GPIOs) of the 40-pin header are shared with devices on the BL Pi-Tron CM4 base board and cannot be used for other tasks.

For the pin assignment of the 40-pin RPI-GPIO-Header, refer to Chapter 10.2.17 40-pin RPI-GPIO-Header (X180).

10.1.18 M.2 slot (X182)

There is a M.2 slot on the bottom side of the BL Pi-Tron CM4 PCB. This M.2 slot has a B-Key coding, which means M.2 NVMe (PCIe) SSDs with a B-Key or M/B-Key coding can be fitted as well as modem cards (with USB connection) for 4G/LTE/5G communication. However, the M.2 slot only supplies 3.3 volts max. Possible card sizes are 2242/3042 (2230 with extension to 2242). This slot is not SATA compatible.

For the pin assignment of the M.2 slot, refer to Chapter 10.2.18 75-pin M.2 slot coded for M.2 Key-B devices.

10.1.19 Nano SIM card slot (X191)

There is a nano SIM card slot on the BL Pi-Tron CM4, which can be used to insert nano SIM cards when a modem card will be used in the M.2 slot.

Note: The nano SIM card slot can be replaced with an eSIM for custom OEM versions.

For the pin assignment of the nano SIM card slot, refer to Chapter 10.2.19 Nano SIM card slot (X191).

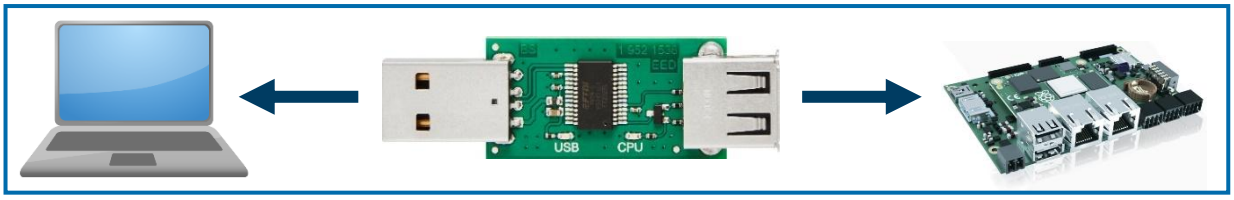
10.1.20 Debug Interface

There is a debug interface using UART protocol with a Mini-B USB connector, see Figure 5 (pos. 20).

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

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 BL Pi-Tron CM4 using a standard USB cable.

Figure 7: 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.

For the pin assignment of the debug connector, refer to Chapter 10.2.20: Debug Connector (X401)

10.1.21 HDMI Interface

There is one HDMI interface (up to 4k resolution) for video solutions, see Figure 5 (pos. 21). The HDMI interface is not designed for connecting cables longer than 3 m. Depending on the monitor and the installation situation, a suitable HDMI cable with folding ferrite must be selected.

For the pin assignment of the HDMI connector, refer to Chapter 10.2.21 HDMI Connector (X80).

10.1.22 WLAN Antenna

This is a Raspberry Pi pre-certified WLAN antenna, specifically designed for the Compute Module 4 from Raspberry Pi. see Figure 5 (pos. 22).

10.1.23 Functional Earth Connection

The GND pin of the power connector is connected to functional earth of the electronics and to the four mounting holes on the edges of the circuit board, see Figure 5 (pos. 23).

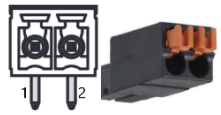
10.1.24 Qwiik Connector

There is a Qwiik Connector for I^2C communication, see Figure 5 (pos. 24).

For the pin assignment of the Qwiik connector, refer to chapter 10.2.22 Qwiik Connector (X183).

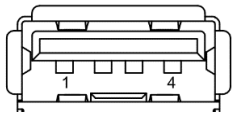
10.2 Connector Pin Assignments

10.2.1 Input Power Connector (X3)

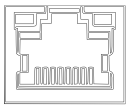
2-Pin Power Mating Connector	Pin	Signal Name
	1	VCC
	2	GND

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

10.2.2 USB Connector (X10)

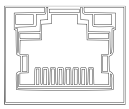
2x USB A 2.0	Pin	Signal Name
	1	+USB_VCC
	2	D-
	3	D+
	4	GND

10.2.3 Ethernet RJ45 Connector (X20)

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

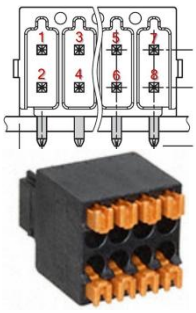
Left LED: Activity / Link		Right LED: Activity 10/100/1000	
Off	10 Mbit/s	Off	No LAN connectivity
Green	100 Mbit/s, 1000 Mbit/s	Yellow	Link
		Blinking	Activity

10.2.4 Ethernet RJ45 Connector (X21)

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.

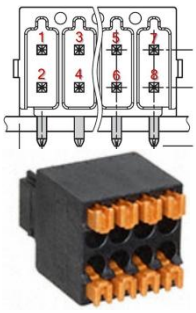
Left LED: Activity / Link		Right LED: Activity 10/100/1000	
Off	10 Mbit/s	Off	No LAN connectivity
Green	100 Mbit/s	Yellow	Link
		Blinking	Activity

10.2.5 RS232 Connector (X30)

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

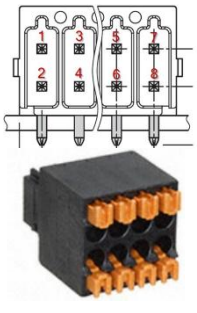
Phoenix Contact Connector 180° DFMC 0,5/4-ST-2,54 (Phoenix 1844594)

10.2.6 RS485/CAN Connector (X40)

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

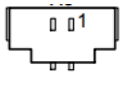
Phoenix Contact Connector 180° DFMC 0,5/4-ST-2,54 (Phoenix 1844594)

10.2.7 DIO Connector (X50)

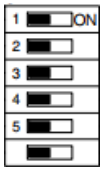
DIO Interface	Pin	Signal Name	Pin	Signal Name
	1	DOUT1 / DIN1 DOUT Imax = 800 mA	2	GND
	3	DOUT2 / DIN2 DOUT Imax = 800 mA	4	GND
	5	DOUT3 / DIN3 DOUT Imax = 800 mA	6	GND
	7	DOUT4 / DIN4 DOUT Imax = 800 mA	8	GND

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

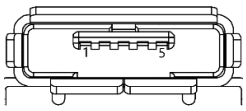
10.2.8 Battery connector for RTC (X3)

2-Pin Mating Connector	Pin	Signal Name
	1	+ 5 V
	2	GND

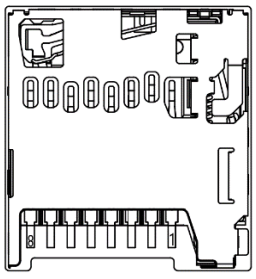
10.2.9 CAN Address and Termination Switch (S1)

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)

10.2.10 USB OTG Connector (X60)

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

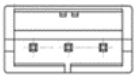
10.2.11 MicroSD Card Slot (X190)

MicroSD Card	Pin	Signal Name
	1	DAT2
	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.

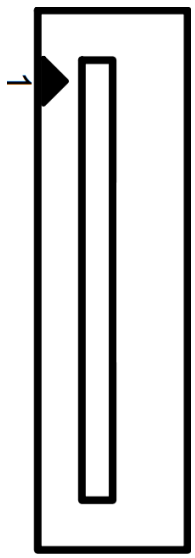
10.2.12 Fan Connector (X181)

3-Pin Mating Connector	Pin	Signal Name
 1 2 3	1	PWM - Controlled via EMC23xx fan controller
	2	+5 V
	3	GND

10.2.13 Family HDMI Connector (Kontron OEM use only, X161)

Family HDMI Connector	Pin	Signal Name
	1 - 40	Reserved use!

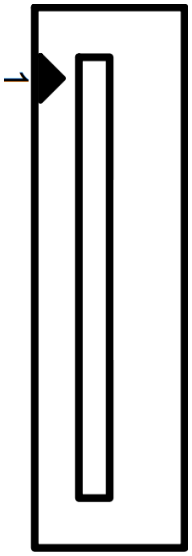
10.2.14 DSI0 Connector (Display Serial Interface, X160)

DSI0 Connector	Pin	Signal Name
	1	GND
	2	DSI0 D0 N
	3	DSI0 D0 P
	4	GND
	5	DSI0 D1 N
	6	DSI0 D1 P
	7	GND
	8	DSI0 C N
	9	DSI0 C P
	10	GND
	11	n.c.
	12	n.c.
	13	GND
	14	n.c.
	15	n.c.
	16	GND
	17	n.c.
	18	n.c.
	19	GND
	20	SCL1
	21	SDA1
	22	+3,3V

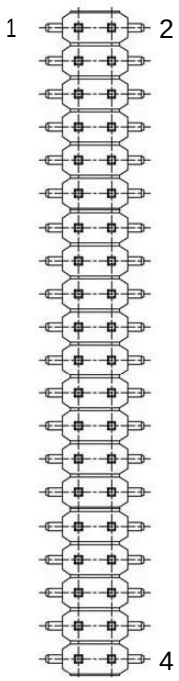
10.2.15 Family DSI1 Connector (Display Serial Interface, Kontron OEM use only, X162)

Family DSI1 Connector	Pin	Signal Name
	1 - 40	Reserved use!

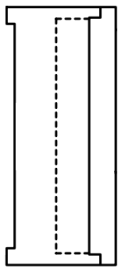
10.2.16 CSI0 Connector (Camera Serial Interface, X170)

DSI0 Connector	Pin	Signal Name
	1	GND
	2	CAM0_DN0
	3	CAM0_DP0
	4	GND
	5	CAM0_DN1
	6	CAM0_DP1
	7	GND
	8	CAM0_CN
	9	CAM0_CP
	10	GND
	11	n.c.
	12	n.c.
	13	GND
	14	n.c.
	15	n.c.
	16	GNF
	17	CAM_GPIO
	18	n.c.
	19	GND
	20	SCL1
	21	SDA1
	22	+3.3 V

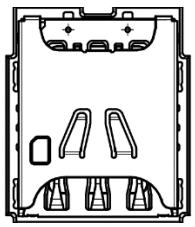
10.2.17 40-pin RPI-GPIO-Header (X180)

40pol.	Pin	Signal Name	Pin	Signal Name
	1	+3.3 V	21	GPIO9
	2	+5 V	22	GPIO25
	3	GPIO2	23	GPIO11
	4	+5 V	24	GPIO8
	5	GPIO3	25	GND
	6	GND	26	GPIO7
	7	GPIO4	27	GPIO0
	8	GPIO14	28	GPIO1
	9	GND	29	GPIO5
	10	GPIO15	30	GND
	11	GPIO17	31	GPIO6
	12	GPIO18	32	GPIO12
	13	GPIO27	33	GPIO13
	14	GND	34	GND
	15	GPIO22	35	GPIO19
	16	GPIO23	36	GPIO16
	17	+3.3 V	37	GPIO26
	18	GPIO24	38	GPIO20
	19	GPIO10	39	GND
	20	GND	40	GPIO21

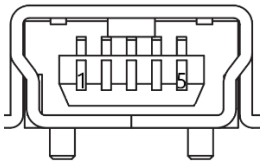
10.2.18 75-pin M.2 slot coded for M.2 Key-B devices

M.2 Slot, B-Key, 75 pol	Pin	Signal Name
	1 - 75	The slot is coded for M.2 Key-B devices with a PCIe or USB connection. SATA devices can not be used with this slot. Maximum voltage rating 3,3 volts.

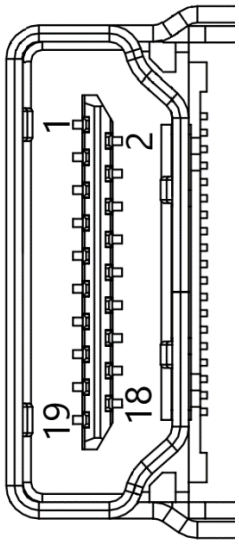
10.2.19 Nano SIM card slot (X191)

Nano-SIM card slot	Pin	Signal Name
	1	VCC
	2	RST
	3	CLK
	4	GNF
	5	VPP
	6	IO

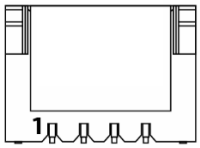
10.2.20 Debug Connector (X401)

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

10.2.21 HDMI Connector (X80)

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

10.2.22 Qwiik Connector (X183)

BM04B-SRSS-TBT	Pin	Signal Name
	1	GND
	2	+3.3 V
	3	SDA
	4	SCL

11 Accessing Components and Extending the Device

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.

CAUTION

The installation/removal of system components may only be performed by a qualified person. Please observe the "Safety Instructions" contained within this user guide.

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 BL Pi-Tron CM4 supports a removable microSD card.

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

- Insert the microSD into the microSD card slot on the right-hand side. Push the microSD card in fully until it clicks into position. Take care of the correct microSD card position otherwise the slot can be damaged.
- To release a microSD card, press the microSD card on the right-hand side of the BL Pi-Tron CM4 in slightly, then release the card.
- The microSD card is ejected by a spring-loaded mechanism for easier removal.
- Take out the microSD card from the SD card slot to fully remove it from the device

11.2 Extending the Device

- When installing additional modules, ensure that the workspace is clean.
- After installing the additional modules, please check the product for any damage.
- The power consumption of each additional module must not exceed the specified limit.
- Structural changes and modifications must be approved by Kontron Electronics. Unauthorised structural modifications and conversions will result in the loss of any warranty.
- Only trained personnel are authorised to handle and operate the device.

12 Storage, Transportation and Maintenance

12.1 Storage

If the product is not in use for an extended period time, disconnect the power. 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 BL Pi-Tron CM4.

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 Cell Battery

The coin cell battery (CR2032) with cable must only be replaced with the same type of battery or with a type of battery recommended by Kontron Electronics. If the connected Lithium battery needs to be replaced, follow the steps below:

- Remove the battery by unplugging it from the two-pin connector.
- Connect the new battery to the two-pin connector in the correct orientation. If needed affix the battery itself on a flat surface using double sided tape, a clamp, or a battery holder.
- Pay attention to the polarity of the battery cable.

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. The battery type must be UL recognized.

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 Baseboard

For the first startup of the BL Pi-Tron CM4, you will find more information and additional hardware information at the online documentation.

Please follow the link: https://docs.kontron-electronics.de/

The online documentation is primarily intended for our Development Kit but will help you also to put your BL Pi-Tron CM4 into operation.

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

Note that the Raspberry Pi OS, obtained from https://www.raspberrypi.com/software/, contains 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 and others. Check the respective copyright notices of the package(s) in question.

You can also contact us at:

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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 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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