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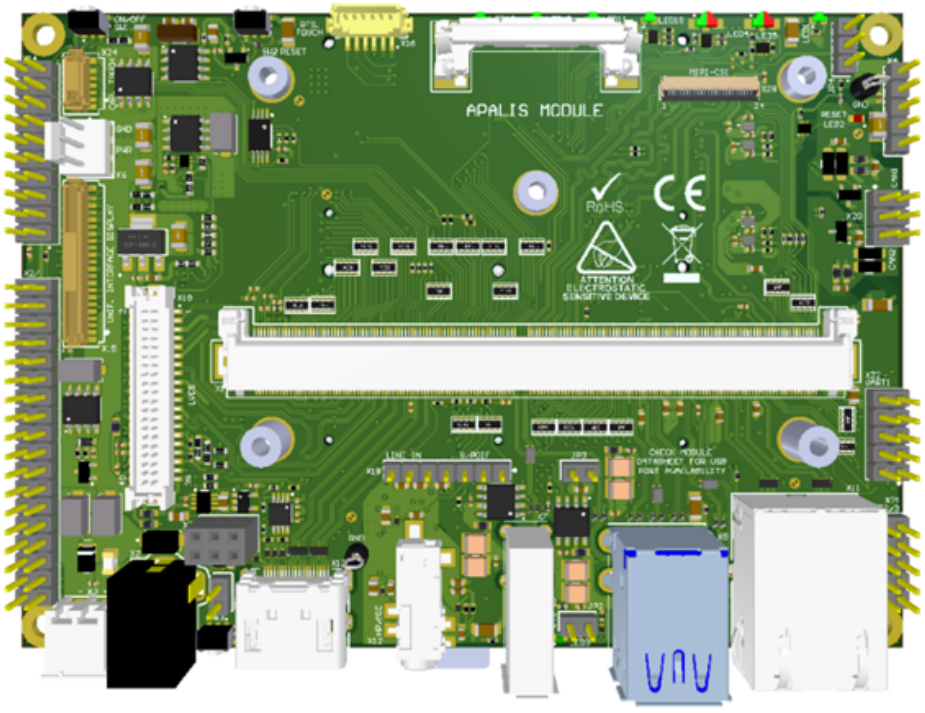
Ixora Carrier Board

HW Datasheet



Revision History

Table 1: Revision History

Date	Document Revision	Product Version	Changes
11-August-2021	Rev. 1.0	V1.3	- Section 1.2, Abbreviation table was added - Section 3.2.2.1, Updated pull resistor values - Section 3.5.3, Updated pull resistor values - Section 3.6.1, Updated pull resistor values - Minor changes and fixes
24-February-2023	Rev. 1.1	V1.3	- Updated document landing page - Updated footer - The product mechanical shape in the relevant pictures have been updated to show the latest product revision - Section 3.8.1: added pull-up details to the table - Section 3.9.3: updated X17 part number - Minor changes and fixes
22-August-2024	Rev. 1.1	V1.3	- Minor changes and fixes

Contents

1 Introduction

Ixora is a carrier board for the Apalis family of System-on-Modules (SoMs) / Computer-on-modules (CoMs). Ixora is designed to provide access to some of the most important features supported by the Apalis family.

The major part of the standard interfaces supported by the Apalis modules is exposed on the Ixora carrier board through a combination of real-world connector interfaces, card slots, and 2.54mm pitch pin headers. The real-world connectors, LEDs, and push buttons are all placed on the board edge in a way that easily allows for a boxed version of the Ixora carrier board.

1.1 Reference Documents

For detailed technical information about suitable computer modules, please refer to the documents listed below.

1.1.1 Apalis System on Modules

An overview of the Apalis product family:

https://www.toradex.com/computer-on-modules/apalis-arm-family

1.1.2 Push-button On/Off Controller Datasheet

https://www.analog.com/media/en/technical-documentation/data-sheets/2954fb.pdf

1.1.3 DC/DC Buck / Step-down converter Datasheets

http://www.aosmd.com/res/data_sheets/AOZ2261AQI-10.pdf

http://www.aosmd.com/res/data_sheets/AOZ2260AQI-10.pdf

1.1.4 Isolated CAN Transceiver Datasheet

https://www.analog.com/media/en/technical-documentation/data-sheets/ADM3055E-3057E.pdf

1.1.5 RS232 Transceiver Datasheet

https://www.ti.com/lit/ds/symlink/max3243.pdf

1.1.6 Serial RTC Datasheet

https://www.st.com/resource/en/datasheet/m41t0.pdf

1.1.7 EEPROM Datasheet

https://ww1.microchip.com/downloads/en/devicedoc/atmel-8781-seeprom-at34c02d-datasheet.pdf

1.1.8 Toradex Developer Website - Carrier Board Design

https://developer.toradex.com/carrier-board-design

1.2 Abbreviations

Table 2: Abbreviations

Abbreviation	Explanation
ADC	Analog to Digital Converter
CAN	Controller Area Network, a bus that is mainly used in the automotive and industrial environment
CAN FD	Controller Area Network Flexible Data-Rate, an extension to the original CAN bus protocol, allows higher data rates and larger message sizes
CEC	Consumer Electronic Control, HDMI feature that allows controlling CEC compatible devices
CPU	Central Processor Unit
CSI	Camera Serial Interface
DDC	Display Data Channel, interface for reading out the capability of a monitor. In this document DDC2B (based on I2C) is always meant
DVI	Digital Visual Interface, digital signals are electrically compatible with HDMI
ESD	Electrostatic Discharge, high voltage spike or spark that can damage electrostatic-sensitive devices
GND	Ground
GND_CHASSIS	Chassis Ground
GPIO	General Purpose Input/Output, pin that can be configured as an input or output
GSM	Global System for Mobile Communications
HDMI	High-Definition Multimedia Interface (HDMI) is a proprietary audio/video interface for transmitting uncompressed video data and compressed or uncompressed digital audio data from an HDMI-compliant source device, such as a display controller, to a compatible computer monitor, video projector, digital television, or digital audio device
I2C	Inter-Integrated Circuit, the two-wire interface for connecting low-speed peripherals
I/O	Input-Output
LAN	A local area network is a computer network that interconnects computers within a limited area
LED	Light-emitting diode
LCD	Liquid Crystal Display
LVDS	Low-Voltage Differential Signaling is an electrical interface standard that can transport high-speed signals over twisted-pair cables. Many interfaces like PCIe or SATA use this interface. Since the first successful application was the Flat Panel Display Link, LVDS became synonymous with this interface. In this document, the term LVDS is used for the FPD-Link interface.
MAC	Medium Access Control is part of the second layer (data link layer) in the Ethernet stack
MIPI	Mobile Industry Processor Interface Alliance
MDI	Medium Dependent Interface, the physical interface between Ethernet PHY and cable connector
mini PCIe	PCI Express Mini Card, the card form factor for internal peripherals. The interface features PCIe and
Mini-SIM	USB 2.0 connectivity
mSATA	Same as the 'SIM' abbreviation SATA is Serial Advanced Technology Attachment. It is an IDE (Integrated Drive Electronics) standard connecting optical and hard drives to motherboards.
MMC	Multi-Media Card, flash memory card
NC	Not Connected
OD	Open-Drain
OTG	USB On-The-Go, a USB host interface that can also act as a USB client when connected to another host interface
PCB	Printed Circuit Board
PCI	Peripheral Component Interconnect, parallel computer expansion bus for connecting peripherals
PCIe	PCI Express, a high-speed serial computer expansion bus, replaces the PCI bus
PD	Pull-Down Resistor
PHY	The physical layer of the OSI model

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Table 2: Abbreviations (Continued)

Abbreviation	Explanation
PU	Pull-up Resistor
PWM	Pulse-Width Modulation
PWR	Power
RJ45	Registered Jack, common name for the 8P8C modular connector that is used for Ethernet wiring
RS232	The single-ended serial port interface
SD	Secure Digital, flash memory card
SDIO	Secure Digital Input Output, an external bus for peripherals that uses the SD interface
SIM	Subscriber Identification Module, an identification card for GSM phones
SoC	System on a Chip, IC which integrates the main component of a computer on a single chip
SoM	System on a Module, PCB which integrates the main component of a computer on a single board
SPI	Serial Peripheral Interface Bus, synchronous four-wire full-duplex bus for peripherals
SSD	A solid-state drive is a storage device that uses integrated circuit assemblies to store data persistently, typically using flash memory
TIM	Thermal Interface Material, thermally conductive material between CPU and heat spreader or heat sink
UART	Universal Asynchronous Receiver/Transmitter, serial interface, in combination with a transceiver an RS232, RS422, RS485, IrDA or similar interface can be achieved
USB	Universal Serial Bus, serial interface for internal and external peripherals
WLAN	Wireless LAN is a wireless computer network that links two or more devices using wireless communication to form a LAN. It is based on IEEE 802.11 standards
WPAN	Wireless personal area network (PAN) is a PAN carried over a low-powered, short-distance wireless network technology such as IrDA, Wireless USB, Bluetooth, or ZigBee
WWAN	A wireless wide area network is a form of a wireless network. The larger size of a wide area network. It differs from WLAN by using mobile telecommunication cellular technologies such as 2G, 3G, 4G, LTE, and 5G to transfer data

2 Features

2.1 Overview

The Ixora Carrier Board provides the following features and communication interfaces:

- 1x USB 2.0
- 2x USB 3.0 port
- USB 2.0 OTG Micro-AB connector (shared) for host and host/client
- RJ45 Ethernet (10/100/1000 Mbit)
- 1x microSD 4 Bit
- 1x mSATA
- Mini PCIe with SIM card connector
- Digital (TDMS) interface on HDMI connector
- Dual-channel LVDS interface (up to 24-bit color)
- Unified Interface Display with built-in resistive touch for direct LCD panel connection
- Resistive touch screen connector 4/5-wire
- Capacitive touch screen connector
- Analog audio I/O on 3.5mm stereo jack
- S/PDIF I/O on the header
- Line IN on header
- 1x MIPI CSI Interface
- 10-bit Parallel Camera Interface
- 3x RS232 Serial Interfaces
- 2x I2C, 1x SPI, 4x PWM, 4x Analog inputs, 8xGPIOs
- 2x CAN FD Interface (up to 1Mbit/s)
- Real-time clock with battery backup
- GPIO Controlled LEDs
- FAN connector

2.2 Hardware Architecture Block Diagram

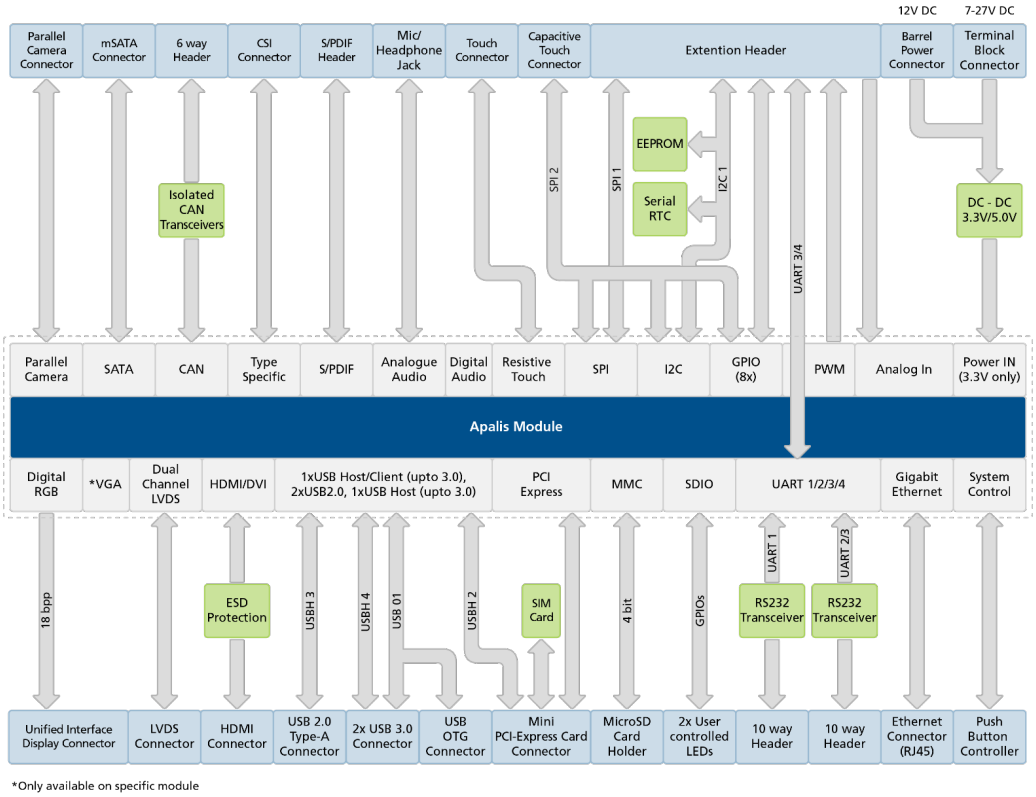

Figure 1: Ixora Carrier Board Hardware Architecture

2.3 Physical Drawing

2.3.1 Top Side Connectors

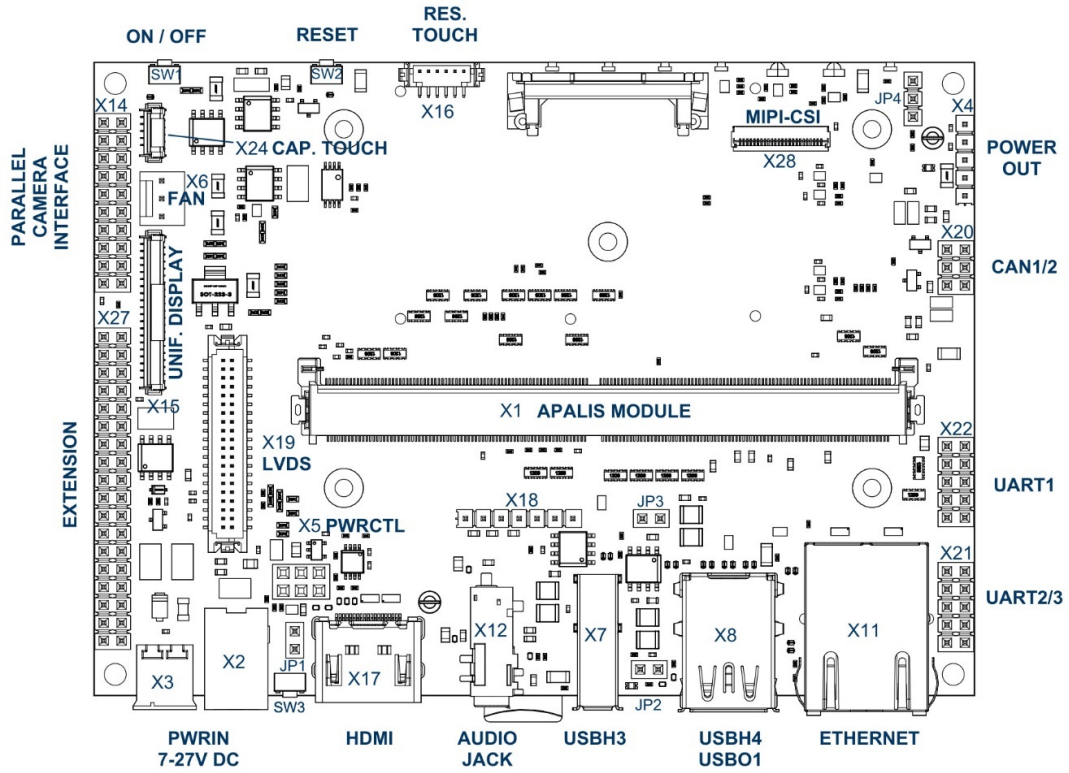

Figure 2: Ixora Carrier Board Connectors – Top Side

Table 3: Top Side Connectors

Ref	Description	Remarks
X1	Apalis MXM3 Connector	
X2	Terminal Block Power Supply Connector (Power In)	
X3	Barrel Power Supply Connector (Power In)	
X4	Power Out Header	
X5	Power Control Header	
X6	FAN Connector	
X7	USB HOST	USBH3
X8	USB HOST SS	TOP: USBH4 – BOTTOM: USBO1 (Shared with X9)
X11	Gigabit Ethernet	
X12	Audio In/Out Jack	
X14	Parallel Camera Header	
X15	Unified Interface Display	
X16	Touch-Screen Connector	
X17	HDMI Connector	
X18	Line IN – S/PDIF Header	
X19	LVDS Connector	

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Table 3: Top Side Connectors (Continued)

Ref	Description	Remarks
X20	CAN Header	
X21	RS232 Header	RS232-2 – RS232-3
X22	RS232 Header	RS232-1
X24	Capacitive Touch Connector	
X27	Extension Header	
X28	MIPI-CSI Connector	
JP4	Recovery Mode Jumper	Refer to modules datasheet for more information

2.3.2 Bottom Side Connectors

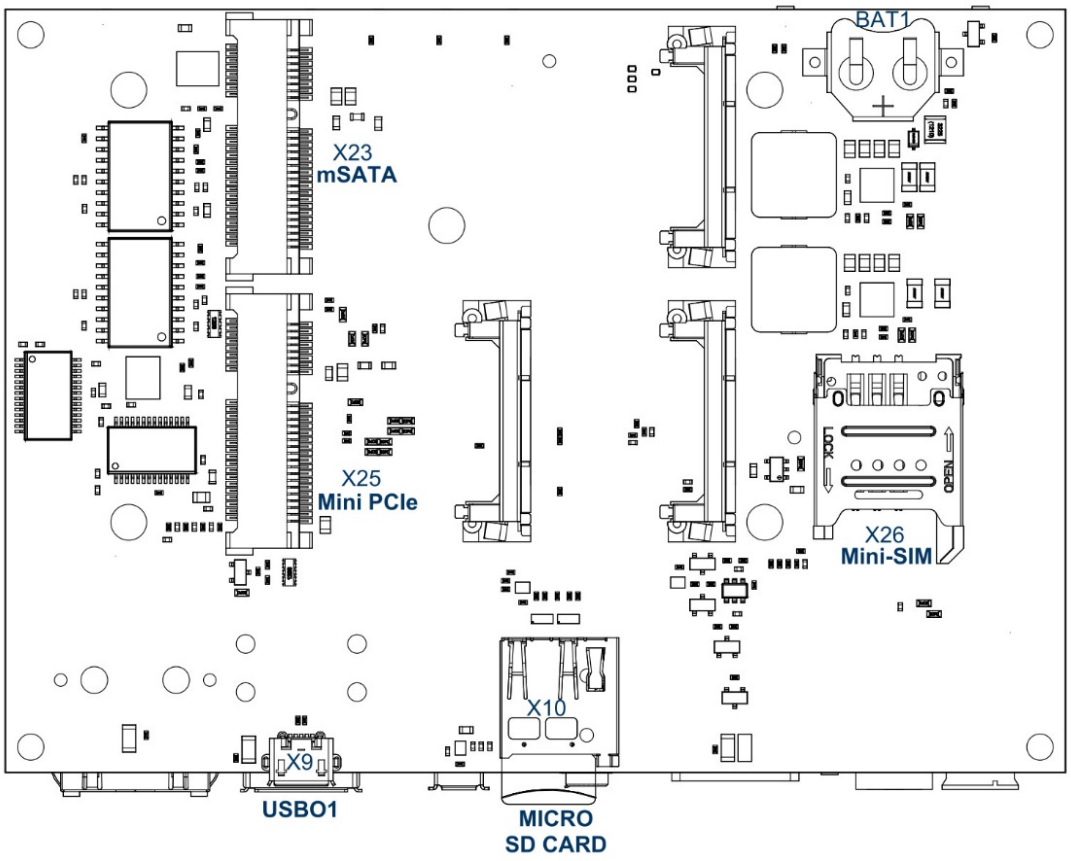

Figure 3: Ixora Carrier Board Connectors – Bottom Side

Table 4: Bottom Side Connectors

Ref	Description	Remarks
X9	USB OTG	USBO1 (High Speed shared with X8)
X10	Micro SD Card Holder	
X23	mSATA	
X25	Mini PCIe	
X26	Mini-SIM card Holder	
BAT1	12mm Battery holder	Supported batteries: CR1216, BR1220, CL1225

2.4 Assembly Options

This section marks/highlights the components on the Ixora carrier board that can be used to configure different features and functional options.

WARNING:

- Changing the PCB assembly voids the product warranty.
- Toradex does not take any responsibility for malfunction or damages caused by changing any assembly option.

2.4.1 Ixora Assembly Option – Top Side

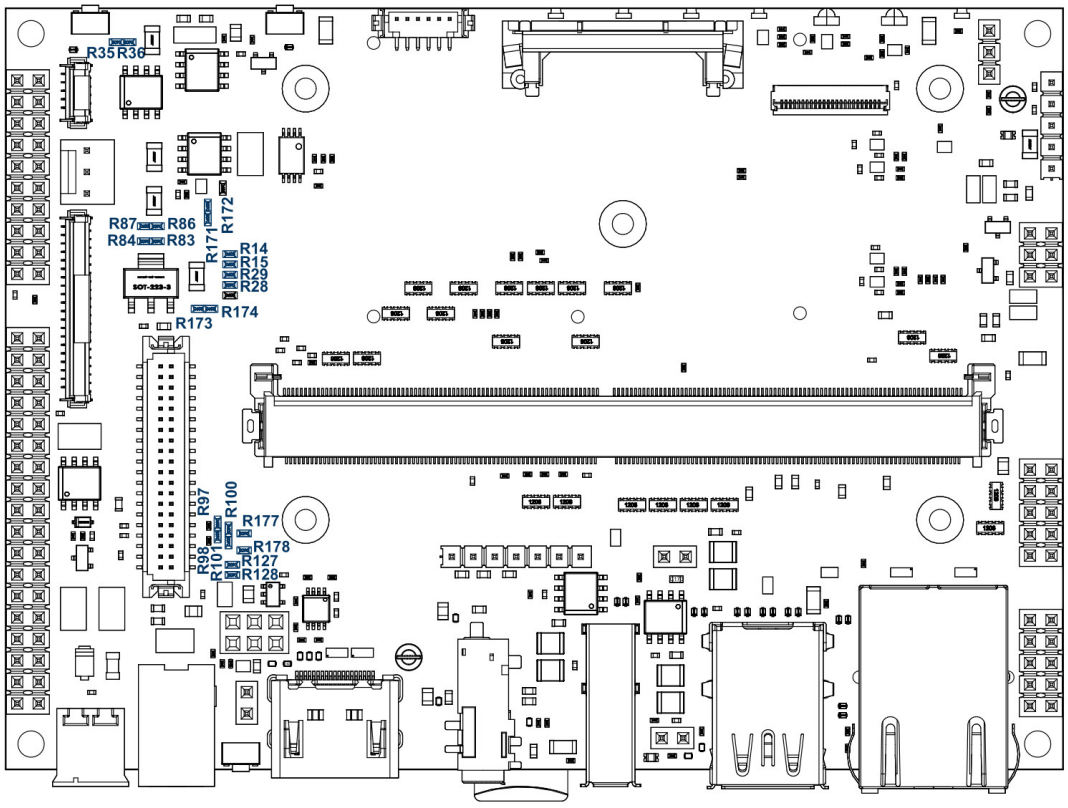

Figure 4: Ixora Carrier Board Connectors – Bottom Side

2.4.2 Ixora Assembly Option – Bottom Side

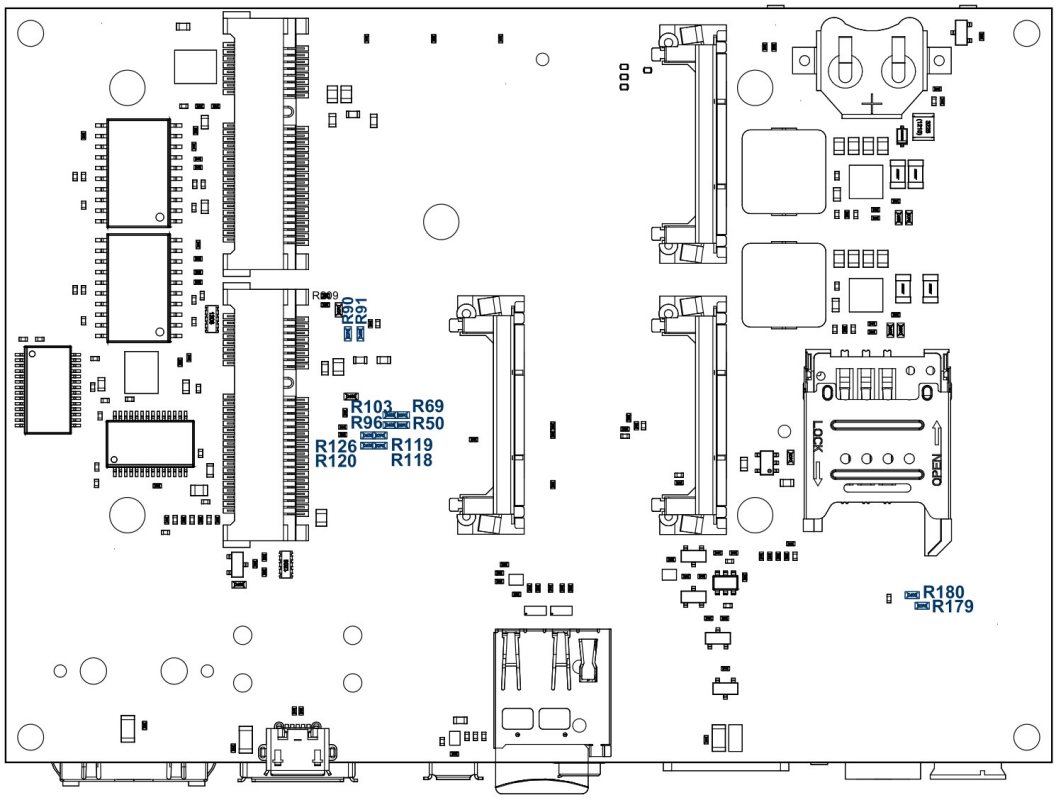

Figure 5: Ixora Carrier Board Connectors – Bottom Side

3 Interface Description

3.1 Apalis System-On-Module

Type: MXM3 321 pin Socket Manufacturer: JAE - MM70-314-310B1-1-R300

For the pinout of the Apalis module, please refer to the Apalis module datasheet.

MXM3 SnapLock and Spacers are available on Ixora for fixing the Apalis module with the carrier board. Please use M3 size screws to fasten the Apalis module with the Spacers.

3.2 Power Supply

3.2.1 Power Supply Connectors

Ixora provides two methods of supplying power to the board:

- The connector X2 is a standard 5.5mm power jack barrel connector widely used in consumer electronic devices.
- The pluggable connector X3 is the dual-pin male screw type terminal block widely used in industrial applications. This connector is not assembled by default.

X2 and X3 are connected to the power output connector X4, the FAN connector X6, and the LVDS connector X19. For this reason, when the 12V voltage supply is required on these connectors, the input voltage must be 12V +/-10%.

Both the connectors have a wide input voltage range of 7 - 27V DC.

The on-board power supply provides the following supplies (maximum power).

- 5V / 6A (30W)
- 3.3V / 8A (26.4W)

The supply is protected against reverse input voltage polarity and short circuits.

3.2.1.1 Barrel Power Supply Connector (X2) Connector type: SwitchCraft RAPC722X

Table 5: Barrel Power Supply Connector (X2)

Pin	Description	Voltage / range
1	GND_IN	
2	PWR_IN	7 – 27V

3.2.1.2 Terminal Block Power Supply Connector (X3) Connector type: Tyco 284512-2, not assembled

Table 6: Terminal Block Power Supply Connector (X3)

Pin	Description	Voltage / range
1	GND_IN	
2	PWR_IN	7 – 27V

3.2.1.3 Power Out Header (X4) Connector type: 1×5 Pin Header Male, 2.54mm, not assembled

Table 7: Power Out Header (X4)

Pin	Description	Voltage / range
1	+3.3V_SW	+3.3V
2	GND	
3	+5V_SW	+5V
4	GND	
5	V_SUPPLY_FILT_SW	PWR_IN

Please note that pin 5 is not regulated voltage as it is directly connected to the power supply connectors X2 and X3.

3.2.2 Power Control

Power control of the Ixora is implemented using a Linear LTC2954 Pushbutton On/Off controller and the signal POWER_ENABLE_MOCI, which enables the peripheral power supplies.

For information about the signals provided by the controller LTC2954, please refer to the datasheet. Please refer to the document “Apalis Carrier Board Design Guide” for more information regarding the power-up sequence implemented on the board.

The switches SW1 and SW2 have been assigned the ON/OFF and Reset function, respectively. The SW3 is, by default, connected to pin 186 of the MXM3 connector and can be used to activate particular functionalities such as factory default restore. When the R91 resistor is disassembled, and the R90 resistor is assembled, SW3 is routed to pin 63, the Recovery Mode pin for the Apalis T30 module.

Please note that pin 63 of the MXM3 connector can only be used to enter Recovery Mode on the Apalis T30 and TK1 module, not on iMX6 and iMX8 modules, due to the inverted signal level.

The Power Control Header X5 allows the Reset and Power Button control signals to be accessed externally.

3.2.2.1 Power Control Header (X5) Connector type: 2×3 Pin Header Female, 2.54mm

Table 8: Power Control Header (X5)

Pin	Signal Name	MXM3 Pin Number	I/O Type	Voltage	Pull-up / Pull-down
1	PWR_BTN#		I		100k to +1.9V
2	GND		PWR		
3		PWR_CTRL	I	+3.3V max	100k to GND
4	INT#		I		10k to +3.3V
5	FORCE_OFF#		I		100k to +3.3V
6	RESET_MICO#	28	I/O	+3.3V	

Pin 3 of the Power Control Header X5 can be used to override the Pushbutton controller. The following table shows the behavior of the board according to the level of the PWR_CTRL signal:

Table 9: Board behavior accordingly to the the PWR_CTRL signal level

PWR_CTRL Level	Description
0V	The Pushbutton controller is working normally
3.3V	The Ixora carrier board is Always On when power is applied

3.2.2.2 Always-On Jumper (JP1)

Jumper JP1 can be used to obtain “Always On” behavior.

Connector type: 1×2 Pin Header Male, 2.54 mm

Table 10: Always-On Jumper (JP1)

Jumper position	Description
Open	The board power supply is controlled via power On/Off Switch.
Closed	The board power supply is in the ”Always On” state. The Ixora carrier board powers up as soon as external power is applied.

The following table describes the assembly options available on the Ixora carrier board for the Switch SW3:

Table 11: Available assembly options (Switch SW3)

Solution Selected	Assembly Options	Assembled Components on Ixora V1.1	PCB Side
SW3 connected to pin 63 of the MXM3 connector (Recovery Mode pin on Apalis T30).	Assemble resistors R90 Disassemble resistors R91	R91	Bottom
SW3 connected to pin 186 of the MXM3 connector.	Assemble resistors R91 Disassemble resistors R90	R91	Bottom

Please refer to figure 5 in Section 2.4, Assembly Options, for the position of the resistors.

3.2.3 FAN Connector

Ixora provides a FAN connector, X6. The voltage available at this connector is connected to the V_SUPPLY_FILT voltage using a transistor controlled by 3.3V_SW or, optionally, using the GPIO8 signal for software control.

3.2.3.1 FAN Connector (X6)

Connector type: 1×3 Pin Header Male with friction lock, 2.54 mm

Table 12: FAN Connector (X6)

Pin	Signal Name	I/O Type	Voltage	Pull-up/Pull-down
1	GND	PWR	PWR_IN	
2	V_FAN_UNREG	PWR		
3	NC			

Please note that the V_FAN_UNREG voltage is not regulated as this is the same voltage provided on the X2 and X3 connectors.

The following table describes the assembly options available on the Ixora carrier board for the

FAN connector:

Table 13:

Solution Selected	Assembly Options	Assembled Components on Ixora V1.0	PCB Side
Use the GPIO_8 to control the FAN power	Assemble resistors R35 Disassemble resistors R36	R35	Top
Use 3.3V_SW signal to control the FAN power	Assemble resistors R36 Disassemble resistors R35	R35	Top

Please refer to figure 4 in Section 2.4, Assembly Options, for the position of the resistors.

3.3 Indications

Ixora features 9 LEDs as indications for the status of some of the interfaces available on board. Two of these LEDs are dual-color type and can be controlled using Apalis module GPIOs.

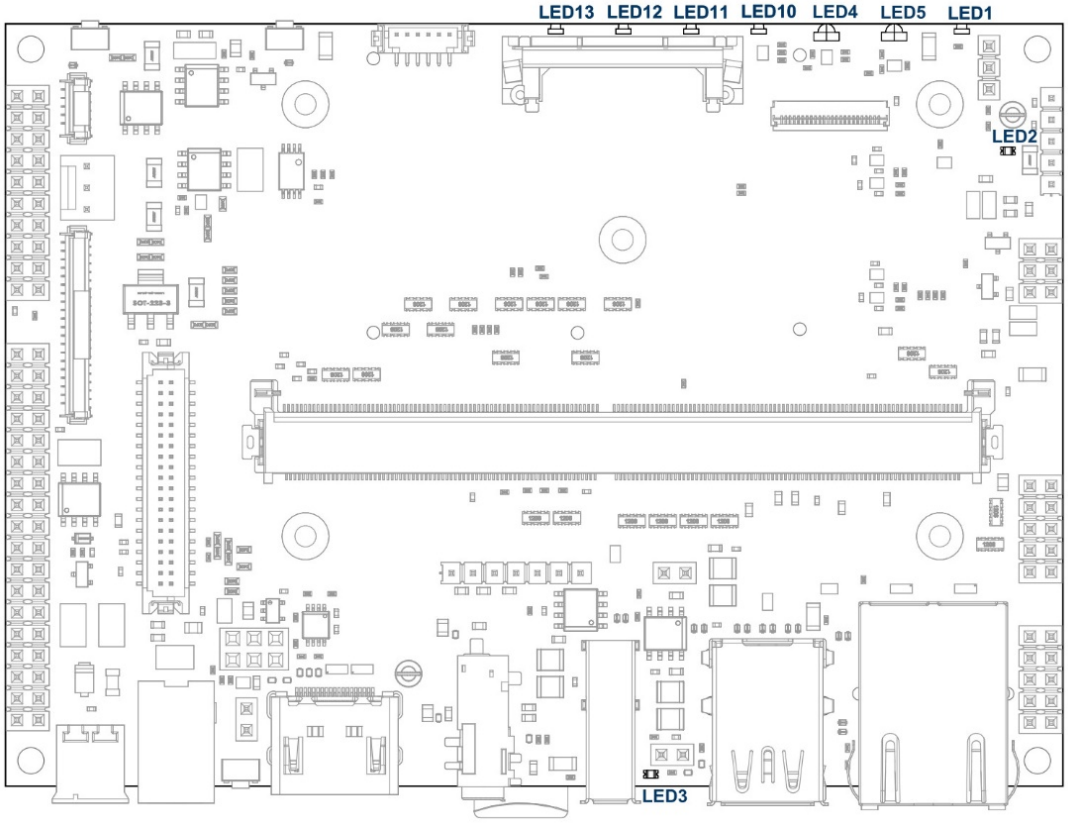

Figure 6: Indicator LEDs

The following table describes the signal associated with the LEDs:

Table 14:

LED No.	Signal Name
LED1	The 3.3V_SW voltage is available

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Table 14: (Continued)

LED No.	Signal Name
LED2	The signal RESET_MOCI# is low; therefore, the module is reset (not assembled by default)
LED3	The VCC_USBO1 voltage is available; therefore, the bottom part of the connector X8 is used as HOST.
LED4_RED	Dual-color LED. This LED is RED when the signal on pin 178 of the MXM3 connector is high.
LED4_GREEN	Dual-color LED. This LED is GREEN when the signal on pin 188 of the MXM3 connector is high.
LED5_RED	Dual-color LED. This LED is RED when the signal on pin 156 of the MXM3 connector is high.
LED5_GREEN	Dual-color LED. This LED is GREEN when the signal on pin 152 of the MXM3 connector is high.
LED10	This LED indicates that the mSATA device is active.
LED11	Mini PCIe status indicator: WLAN
LED12	Mini PCIe status indicator: WWAN
LED13	Mini PCIe status indicator: WPAN

3.4 Ethernet

Ixora provides an RJ45 connector with integrated magnetics for 10/100/1000Mbit Ethernet.

3.4.1 Ethernet Connector (X11)

Connector type: RJ45, BEL Fuse A829-1J1T-KM

Table 15: Ethernet Connector (X11)

Pin	Signal Name	MXM3 Pin Number	I/O Type	Voltage	Pull-up/Pull-down
1	ETH1_CTREF_2				
2	ETH1_MDI2_N	34			
3	ETH1_MDI2_P	32			
4	ETH1_MDI1_P	56			
5	ETH1_MDI1_N	54			
6	ETH1_CTREF_1				
7	ETH1_CTREF_3				
8	ETH1_MDI3_P	38			
9	ETH1_MDI3_N	40			
10	ETH1_MDI0_N	48			
11	ETH1_MDI0_P	50			
12	ETH1_CTREF_0				
13	ETH1_ACT_C	42 (via R70)			
14	3.3V_SW		PWR	+3.3V	
15	ETH1_LINK_GB	44 (via R72)			
16	3.3V_SW		PWR	+3.3V	
17	ETH1_LINK_C	44 (via R71)			
S1/S2	CHASSIS_GND		PWR		

3.5 USB

Ixora has a 1x USB 2.0 host interface (X7) and a USB 2.0 OTG interface available on a Micro-AB connector (X9).

The USB 2.0 part of the USB OTG interface is shared with the dual-stacked USB 3.0 type A connector X8 (bottom), which can be used with the modules that support the USB SuperSpeed interface.

By using the jumper JP2, it is possible to determine whether the interface USBO1 is used as an OTG interface through the connector X9 or as a Host interface available on the bottom part of the connector X8.

The Jumper JP2 is used to connect the USBO1_ID signal to GND: the USBO1_ID signal enables the VCC_USBO1 voltage the same way as when the port X9 is used as HOST.

When the VCC_USBO1 is enabled, the bottom part of the connector X8 or X9 is used as HOST.

Special attention needs to be paid to the JP2 jumper when the X9 connector has to be used as CLIENT.

To indicate that the voltage VCC_USBO1 is enabled, LED3 has been installed on the board.

The following table summarizes the jumper JP2 configuration.

Connector type: 1×2 Pin Header Male, 2.54 mm

Table 16:

Jumper position	Description
Open	The connector X8 (bottom) is not powered. The connector X9 is used as OTG.
Closed	The connectors X8 (bottom) and X9 are configured as HOST only.

3.5.1 USB Host (X7)

Connector type: USB Type-A, FCI 73725-0110BLF

Table 17: USB Host (X7)

Pin	Signal Name	MXM3 Pin Number	I/O Type	Voltage	Pull-up/Pull-down
1	VCC_USBH2		PWR	+5V	
2	USBH_D_CON_N	88			
3	USBH_D_CON_P	86			
4	GND_USBH2		PWR		
S1, S2, S3, S4	CHASSIS_GND	PWR			

By default, Apalis USBH2 and USBH3 interfaces are connected to Mini PCIe Connector (X25) and USB Host connector (X7), respectively. The assembly options enable changing the routing of Mini PCIe Connector (X25) and the USB Host connector (X7) to the USBH2/3 interfaces.

Customers must pay special attention while making the assembly changes to ensure that only one USBHx interface is connected to one connector at a time.

The following table describes the assembly options available on the Ixora carrier board for the USB Host connector (X7):

Table 18:

Solution Selected	Assembly Options	Assembled Components on Ixora V1.1	PCB Side
Connect Apalis USBH3 interface to USB Host connector (X7) and Apalis USBH2 interface to Mini PCIe Connector (X25)	Assemble resistors R96, R103, R118, R119 Disassemble resistors R50, R69, R120, R126	R96, R103, R118, R119	Bottom
Connect Apalis USBH2 interface to USB Host connector (X7) and Apalis USBH3 interface to Mini PCIe Connector (X25)	Assemble resistors R50, R69, R120, R126 Disassemble resistors R96, R103, R118, R119	R96, R103, R118, R119	Bottom

Please refer to figure 5 in Section 2.4, Assembly Options for the position of the resistors.

3.5.2 USB Host SS (X8)

Connector type: Stacked USB 3.0 Type-A, Amphenol GSB311231HR

Table 19: USB Host SS (X8)

Pin	Signal Name	MXM3 Pin Number	I/O Type	Voltage	Pull-up/Pull-down
U1	VCC_USBH4		PWR	+5V	
U2	USBH4_D_CON_N	100			
U3	USBH4_D_CON_P	98			
U4	GND_USBH4		PWR		
U5	USBH4_SSRX_N	92			
U6	USBH4_SSRX_P	94			
U7	GND_USBH4		PWR		
U8	USBH4_SSTX_N	104			
U9	USBH4_SSTX_P	106			
L1	VCC_USBO1		PWR	+5V	
L2	USBO1_D_CON_N	76			
L3	USBO1_D_CON_P	74			
L4	GND_USBO1		PWR		
L5	USBO1_SSRX_N	64			
L6	USBO1_SSRX_P	62			
L7	GND_USBO1		PWR		
L8	USBO1_SSTX_N	70			
L9	USBO1_SSTX_P	68			
S1, S2, S3, S4	CHASSIS_GND		PWR		

3.5.3 USB Client (X9)

Connector type: Micro AB Type, Hirose ZX62-AB-5PA(31)

Table 20: USB Client (X9)

Pin	Signal Name	MXM3 Pin Number	I/O Type	Voltage	Pull-up/Pull-down
1	VCC_USBO1		PWR	+5V	
2	USBO1_D_CL_N	76 (via R55)			
3	USBO1_D_CL_P	74 (via R54)			
4	USBO1_ID	72			10K to 3.3V_SW
5	GND_USBO1		PWR		
S1, S2, S3, S4	CHASSIS_GND		PWR		

3.6 PCIe

Ixora supports the PCI Express interface on the Apalis module and allows Mini PCIe devices to be connected.

By changing the value of the GPIO connected to pin 176 of the MXM3 connector, it is possible to disable the wireless capabilities of the mini PCIe card assembled in the connector X25. In particular, the wireless is disabled when this signal voltage is zero.

3.6.1 Mini PCIe (X25)

Connector type: Mini PCIe Card Connector and Latch, Molex 67910-5700, 48099-5701

Table 21: Mini PCIe (X25)

Pin	Signal Name	MXM3 Pin Number	I/O Type	Voltage	Pull-up/Pull-down
1	PCIE1_WAKE#	37 (via R137)	I/O	+3.3V	
2	3.3V_PCIE1		PWR	+3.3V	
3	NC				
4	GND		PWR		
5	NC				
6	1.5V_PCIE1		PWR	+1.5V	
7	NC				
8	PCIE1_UIM_PWR				
9	GND		PWR		
10	PCIE1_UIM_DATA		I/O		
11	PCIE1_CLK_N	53	O		
12	PCIE1_UIM_CLK				
13	PCIE1_CLK_P	55	O		
14	PCIE1_UIM_RESET				
15	GND		PWR		
16	PCIE1_UIM_VPP				
17	NC				
18	GND		PWR		
19	NC				

Continued on next page

Table 21: Mini PCIe (X25) (Continued)

Pin	Signal Name	MXM3 Pin Number	I/O Type	Voltage	Pull-up/Pull-down
20	PCIE1_WDISABLE#	176 (via R53)	I/O		10K to 3.3V_PCIE1
21	GND		PWR		
22	RESET_MOCI#	26	O	+3.3V	
23	PCIE1_RX_N	41	I		
24	3.3V_PCIE1		PWR	+3.3V	
25	PCIE1_RX_P	43	I		
26	GND		PWR		
27	GND		PWR		
28	1.5V_MSATA1		PWR	+1.5V	
29	GND		PWR		
30	PCIE1_SMCLK		I2C CLK	+3.3V	
31	PCIE1_TX_N	47	O		
32	PCIE1_SMDAT		I/O	+3.3V	
33	PCIE1_TX_P	49	O		
34	GND		PWR		
35	GND		PWR		
36	USBH_PCIE_N	82	I/O		
37	GND		PWR		
38	USBH_PCIE_P	80	I/O		
39	3.3V_PCIE1		PWR	+3.3V	
40	GND		PWR		
41	3.3V_PCIE1		PWR	+3.3V	
42	PCIE1_WWLAN#		O		
43	GND		PWR		
44	PCIE1_WLAN#		O		
45	NC				
46	PCIE1_WPAN#		O		
47	NC				
48	1.5V_MSATA1		PWR	+1.5V	
49	NC				
50	GND		PWR		
51	NC				
52	3.3V_PCIE1		PWR	+3.3V	

By default, the Apalis USBH2 and USBH3 interfaces are connected to the Mini PCIe Connector (X25) and USB Host connector (X7), respectively. When using the assembly options, it is possible to connect the USB Host connector (X7) and Mini PCIe Connector (X25) to connect to the USBH2 or USBH3 interface. Customers must pay special attention while making the assembly changes to ensure that only one USBH interface is connected to one connector at a time.

The following table describes the assembly options available on the Ixora carrier board with re-

spect to the Mini PCIe connector (X25):

Table 22:

Solution Selected	Assembly Options	Assembled Components on Ixora V1.1	PCB Side
Connect Apalis USBH3 interface to USB Host connector (X7) and Apalis USBH2 interface to Mini PCIe Connector (X25)	Assemble resistors R96, R103, R118, R119 Disassemble resistors R50, R69, R120, R126	R96, R103, R118, R119	Bottom
Connect Apalis USBH2 interface to USB Host connector (X7) and Apalis USBH3 interface to Mini PCIe Connector (X25)	Assemble resistors R50, R69, R120, R126 Disassemble resistors R96, R103, R118, R119	R96, R103, R118, R119	Bottom

Please refer to figure 5 in Section 2.4, Assembly Options for the position of the resistors.

3.6.2 Mini-SIM Card Holder (X26)

Connector type: Molex 47023-0001

Table 23: Mini-SIM Card Holder (X26)

Pin	Signal Name	I/O Type	Voltage	Pull-up/Pull-down
1	PCIE1_UIM_PWR	PWR		
2	PCIE1_UIM_RESET	I/O		
3	PCIE1_UIM_CLK	I/O		
5	GND	PWR		
6	PCIE1_UIM_VPP	PWR		
7	PCIE1_UIM_DATA	I/O		

3.7 SATA

Ixora supports the Serial ATA (SATA) interface on the Apalis module and allows peripherals such as mSATA SSDs to be connected.

3.7.1 mSATA (X23)

Connector type: Mini PCIe Card Connector and Latch, Molex 67910-5700, 48099-5701

Table 24: mSATA (X23)

Pin	Signal Name	MXM3 Pin Number	I/O Type	Voltage	Pull-up/Pull-down
1	NC				
2	3.3V_MSATA1		PWR	+3.3V	
3	NC				
4	GND		PWR		
5	NC				
6	1.5V_MSATA1		PWR	+1.5V	
7	NC				

Continued on next page

Table 24: mSATA (X23) (Continued)

Pin	Signal Name	MXM3 Pin Number	I/O Type	Voltage	Pull-up/Pull-down
8	NC				
9	GND		PWR		
10	NC				
11	NC				
12	NC				
13	NC				
14	NC				
15	GND		PWR		
16	NC				
17	NC				
18	GND		PWR		
19	NC				
20	NC				
21	GND		PWR		
22	NC				
23	SATA1_MSATA_RX_P	25	I		
24	3.3V_MSATA1		PWR		
25	SATA1_MSATA_RX_N	27	I		
26	GND		PWR		
27	GND		PWR		
28	1.5V_MSATA1		PWR	+1.5V	
29	GND		PWR		
30	SATA1_MSATA_SCL	211 (via R121)	O	+3.3V	1.8K to 3.3V_SW
31	SATA1_MSATA_TX_N	31	O		
32	SATA1_MSATA_SDA	209 (via R122)	IO	+3.3V	1.8K to 3.3V_SW
33	SATA1_MSATA_TX_P	33	O		
34	GND		PWR		
35	GND		PWR		
36	NC				
37	GND		PWR		
38	NC				
39	3.3V_MSATA1		PWR	+3.3V	
40	GND		PWR		
41	3.3V_MSATA1		PWR	+3.3V	
42	NC				
43	NC				
44	NC				
45	NC				

Continued on next page

Table 24: mSATA (X23) (Continued)

Pin	Signal Name	MXM3 Pin Number	I/O Type	Voltage	Pull-up/Pull-down
46	NC				
47	NC				
48	1.5V_MSATA1		PWR	+1.5V	
49	SATA1_MSATA_ACT#		O		
50	GND		PWR		
51	SATA1_MSATA_PREDET#				
52	3.3V_MSATA1		PWR	+3.3V	

For further information regarding the mSATA interface, please refer to Serial ATA Specification Rev. 3.1 Gold.

3.8 SD Card / MMC

Ixora features a 4bit SDIO interface through a micro SD card socket. The hardware-supported card detect function is implemented. On Ixora V1.2, it is possible to enable/disable SD Card / MMC power. MXM3_148 (MMC1_D4) can be used to enable/disable power to the SD Card / MMC power. Please refer to the Ixora carrier board schematics for more details.

3.8.1 Micro SD Card Holder (X10)

Connector type: Wurth 693071010811

Table 25: Micro SD Card Holder (X10)

Pin	Signal Name	MXM3 Pin Number	I/O Type	Voltage	Pull-up/Pull-down
1	MMC1_D2	144	I/O	+3.3V	
2	MMC1_D3	146	I/O	+3.3V	
3	MMC1_CMD	150	I	+3.3V	
4	3.3V_SD		PWR	+3.3V	
5	MMC1_CLK	154	I	+3.3V	
6	GND		PWR		
7	MMC1_D0	160	I/O	+3.3V	
8	MMC1_D1	162	I/O	+3.3V	
CD1/2	MMC1_CD#	164	O	+3.3V	10k to 3.3V_SW

3.9 Display

Ixora provides many options for connecting LCD panels and monitors, with the following three interfaces supported:

- 18 bit digital RGB
- Dual Channel 24 bit LVDS
- HDMI

Not all the display interfaces are available on all Apalis modules. Carefully check the corresponding

datasheet of the module. Toradex provides a range of different tools and utilities to help with the easy configuration of different LCD panels. For details, please refer to: https:/developer.toradex.com

3.9.1 Unified Interface Display (X15)

Ixora carrier board provides a digital RGB interface port (18-bpp) to interface with the LCD panels using a 40-way, Unified Interface Display connector (X15). It also includes a 4-wire resistive touch screen interface on the same FFC connector.

The Unified Interface Display connector (X15) is compatible with the Resistive Touch Display and EDT display offered by Toradex. A variety of LCD panels with integrated touch support for evaluation purposes are available at the Toradex Webshop.

- https://developer.toradex.com/products/parallel-resistive-touch-display
- https://developer.toradex.com/products/edt-display

For customers looking for a capacitive touch display solution, Ixora carrier boards are fully compatible with the Toradex Capacitive Touch Display solution offered by Toradex. Please refer to the following developer web pages for more details:

- https://developer.toradex.com/products/capacitive-touch-display-7inch-parallel
- https://developer.toradex.com/products/capacitive-multi-touch-display

For more TFT display solutions, refer to the following developer web pages:

- https://developer.toradex.com/knowledge-base/supported-displays
- https://developer.toradex.com/knowledge-base/tianma-rgb-display-adapter-board
- https://developer.toradex.com/knowledge-base/generic-rgb-display-adapter-board

Connector type: Omron XF2M-4015-1A

Table 26: Unified Interface Display (X15)

Pin	Signal Name	Color 18bpp	Mapping	MXM3 Number	I/O Type	Voltage	Pull-up/ down	Pull-
1	GND				PWR			
2	GND				PWR			
3	+3.3V_SW				PWR	+3.3V		
4	+3.3V_SW				PWR	+3.3V		
5	BKL1_ON			286	O	+3.3V		
6	PWM_BKL1			239	O	+3.3V		
7	RESET_MOCI_EDT#			26 (via R81)	O	+3.3V		
8	LCD1_B7	BLUE 5		301	O	+3.3V		
9	LCD1_B6	BLUE 4		299	O	+3.3V		
10	LCD1_B5	BLUE 3		297	O	+3.3V		
11	LCD1_B4	BLUE 2		295	O	+3.3V		
12	LCD1_B3	BLUE 1		293	O	+3.3V		
13	LCD1_B2	BLUE 0		291	O	+3.3V		
14	GND				PWR			
15	LCD1_G7	GREEN 5		283	O	+3.3V		

Continued on next page

Table 26: Unified Interface Display (X15) (Continued)

Pin	Signal Name	Color Mapping 18bpp	MXM3 Number	I/O Type	Voltage	Pull-up/ down	Pull-
16	LCD1_G6	GREEN 4	281	O	+3.3V		
17	LCD1_G5	GREEN 3	279	O	+3.3V		
18	LCD1_G4	GREEN 2	277	O	+3.3V		
19	LCD1_G3	GREEN 1	275	O	+3.3V		
20	LCD1_G2	GREEN 0	273	O	+3.3V		
21	GND			PWR			
22	LCD1_R7	RED 5	265	O	+3.3V		
23	LCD1_R6	RED 4	263	O	+3.3V		
24	LCD1_R5	RED 3	261	O	+3.3V		
25	LCD1_R4	RED 2	259	O	+3.3V		
26	LCD1_R3	RED 1	257	O	+3.3V		
27	LCD1_R2	RED 0	255	O	+3.3V		
28	LCD1_PCLK		243	O	+3.3V		
29	GND			PWR			
30	LCD1_HSYNC		247	O	+3.3V		
31	LCD1_VSYNC		245	O	+3.3V		
32	LCD1_DE		249	O	+3.3V		
33	LCD1_CONF1: Conn GND via assembly o			O	+3.3V/GND		
34	LCD1_CONF2: Conn GND via assembly o			O	+3.3V/GND		
35	GND			PWR			
36	+3.3V_SW			PWR	+3.3V		
37	AN1_TSPY		319	O	+3.3V		
38	AN1_TSMX		317	O	+3.3V		
39	AN1_TSMY		321	O	+3.3V		
40	AN1_TSPX		315	O	+3.3V		

The following table describes the assembly options available on the Ixora carrier board for the Unified Interface Display:

Table 27:

Solution Selected	Assembly Options	Assembled Components on Ixora V1.0	PCB Side
Unified Interface Display, Rotate the display	Assemble appropriate 0R res and R87. Refer to LCD TFT da	R84, R87	Bottom

Please refer to figure 5 in Section 2.4, Assembly Options for the position of the resistors.

3.9.2 LVDS Connector (X19)

Connector type: Hirose DF13A-40DP-1.25V(55)

Table 28: LVDS Connector (X19)

Pin	Signal Name	MXM3 Pin Number	I/O Type	Voltage	Pull-up/Pull-down
1	LVDS1_A_TX3_P	272			
2	GND				
3	LVDS1_A_TX3_N	270			
4	LVDS1_B_CLK_N	276			
5	GND				
6	LVDS1_B_CLK_P	278			
7	LVDS1_A_TX2_P	266			
8	GND				
9	LVDS1_A_TX2_N	264			
10	LVDS1_B_TX0_N	282			
11	GND				
12	LVDS1_B_TX0_P	284			
13	LVDS1_A_TX1_P	260			
14	GND				
15	LVDS1_A_TX1_N	258			
16	LVDS1_B_TX1_N	288			
17	GND				
18	LVDS1_B_TX1_P	290			
19	LVDS1_A_TX0_P	254			
20	GND				
21	LVDS1_A_TX0_N	252			
22	LVDS1_B_TX2_N	294			
23	GND				
24	LVDS1_B_TX2_P	296			
25	LVDS1_A_CLK_P	248			
26	GND				
27	LVDS1_A_CLK_N	246			
28	LVDS1_B_TX3_N	300			
29	GND				
30	LVDS1_B_TX3_P	302			
31	LVDS1_SEL_1: Can be connected to 5V or 3.3V or GND via assembly option. The default assembly is 3.3V				
32	LVDS1_3.3V_SW		PWR	3.3V_SW	
33	LVDS1_SEL_2: Can be connected to 5V or 3.3V or GND via assembly option. The default assembly is 3.3V				

Continued on next page

Table 28: LVDS Connector (X19) (Continued)

Pin	Signal Name	MXM3 Pin Number	I/O Type	Voltage	Pull-up/Pull-down
34	LVDS1_5V		PWR	5V_SW	
35	PWM_BKL1	239			
36	LVDS1_I2C2_SDA	205			
37	BKL1_ON	286			
38	LVDS1_I2C2_SCL	207			
39	LVDS1_12V_SW_UNREG		PWR	V_SUPPLY_FILT_SW	
40	LVDS1_12V_SW_UNREG		PWR	V_SUPPLY_FILT_SW	

Toradex provides a range of different tools and utilities to help with the easy configuration of different LCD panels. For details, please refer to: https:/developer.toradex.com It is possible to configure the levels of the X19 connector's pin 31 and 39 with the assembly options.

The following table describes the assembly options available on the Ixora carrier board for the LVDS interface:

Table 29:

Solution Selected	Assembly Options	Assembled Components on Ixora V1.0	PCB Side
LVDS1_SEL_1 to LVDS1_3.3V_SW	Assemble resistors R97 Disassemble resistors R98 and R99	R97	Top
LVDS1_SEL_1 to LVDS1_5V	Assemble resistors R98 Disassemble resistors R97 and R99	R97	Top
LVDS1_SEL_1 to GND	Assemble resistors R99 Disassemble resistors R97 and R98	R97	Top
LVDS1_SEL_2 to LVDS1_3.3V_SW	Assemble resistors R100 Disassemble resistors R101 and R102	R100	Top
LVDS1_SEL_2 to LVDS1_5V	Assemble resistors R101 Disassemble resistors R100 and R102	R100	Top
LVDS1_SEL_2 to GND	Assemble resistors R102 Disassemble resistors R100 and R101	R100	Top

Please refer to figure 5 in Section 2.4, Assembly Options for the position of the resistors.

3.9.3 HDMI Connector (X17)

Connector type: MOLEX 2086581051

Table 30: HDMI Connector (X17)

Pin	Signal Name	MXM3 Pin Number	I/O Type	Voltage	Pull-up/Pull-down
1	HDMI1_TXD2_P	222			
2	GND		PWR		
3	HDMI1_TXD2_N	224			

Continued on next page

Table 30: HDMI Connector (X17) (Continued)

Pin	Signal Name	MXM3 Pin Number	I/O Type	Voltage	Pull-up/Pull-down
4	HDMI1_TXD1_P	228			
5	GND		PWR		
6	HDMI1_TXD1_N	230			
7	HDMI1_TXD0_P	234			
8	GND		PWR		
9	HDMI1_TXD0_N	236			
10	HDMI1_TXC_P	240			
11	GND		PWR		
12	HDMI1_TXC_N	242			
13	HDMI1_CEC_CON	220	I/O	+5V	
14	NC				
15	HDMI_DDC_SCL	207 (via IC9)	O	+5V	
16	HDMI_DDC_SDA	205 (via IC9)	I/O	+5V	
17	GND				
18	HDMI_VDISP		PWR	+5V	
19	HDMI1_HPD_CON	232	I	+5V	
S1, S2, S3, S4	CHASSIS_GND		PWR		

Note: The Ixora carrier board, in combination with the Apalis TK1 module, shows issues with some HDMI monitors. Please refer to the Ixora Carrier Board Errata “Errata #1: HDMI DDC issues with Apalis TK1” for more details: https://developer.toradex.com/products/ixora-carrier-board#errata.

Ixora carrier board V1.0 and V1.1 are affected by this issue.

3.9.4 Resistive Touch-Screen (X16)

Connector type: Hirose DF13C-6P-1.25V(51)

Table 31: Resistive Touch-Screen (X16)

Pin	Signal Name	MXM3 Pin Number	I/O Type	Voltage	Pull-up/Pull-down
1	GND		PWR		
2	AN1_TSMY	321	I	+3.3V	
3	AN1_TSPY	319	I	+3.3V	
4	AN1_TSMX	317	I	+3.3V	
5	AN1_TSPX	315	I	+3.3V	
6	AN1_TSWIP	311 (via R145)	I	+3.3V	

Remarks: - For further information about the 5-wire resistive touch interface, please refer to our developer site: https://developer.toradex.com/knowledge-base/5-wire-resistive-touch-interface

3.9.5 Capacitive Touch-Screen (X24)

Connector type: Hirose FH12-10S-0.5SVA(54)

Table 32: Capacitive Touch-Screen (X24)

Pin	Signal Name	MXM3 Pin Number	I/O Type	Voltage	Pull-up/Pull-down
1	I2C1_SDA	209	I/O	+3.3V	1.8K to 3.3V_SW
2	I2C1_SCL	211	O	+3.3V	1.8K to 3.3V_SW
3	GND		PWR		
4	GPIO5 / TOUCH_INT#	11	I/O	+3.3V	
5	GPIO6 / TOUCH_RESET#	13	I/O	+3.3V	
6	3.3V_SW		PWR	+3.3V	
7	SPI2_CLK / TOUCH_SSP_CLK	235	O	+3.3V	
8	SPI2_CS / TOUCH_SSP_CS	233	O	+3.3V	
9	SPI2_MOSI / TOUCH_SSP_TX	231	O	+3.3V	
10	SPI2_MISO / TOUCH_SSP_RX	229	O	+3.3V	

3.10 Audio

Ixora offers one analog audio interface provided by the Apalis Module on the X12 connector. This connector is a standard jack for active loudspeakers or headphones and microphone input. The audio jack follows the CTIA (AHJ) pinout standard. Please refer to this Wikipedia (https://en.wikipedia.org/wiki/Phone_connector_(audio)#TRRS_standards) to view the list of compatible headphones.

In addition, Ixora features the Line IN and S/PDIF IN and OUT interfaces on a non-assembled 7-pin header.

3.10.1 Audio Jack (X12)

Connector type: CUI SJ-43516-SMT

Table 33: Audio Jack (X12)

Pin	Signal Name	MXM3 Pin Number	I/O Type	Voltage	Pull-up/Pull-down
1	AAP1_MICIN	306	I	+3.3V	
2	AAP1_HP_AC_L	316 (via C76)	O	+3.3V	
3	AAP1_HP_AC_R	312 (via C77)	O	+3.3V	
4	AGND				
5	AAP1_HP_AC_L	316 (via C76)	O	+3.3V	
6	AAP1_HP_AC_R	312 (via C77)	O	+3.3V	

3.10.2 Line IN – S/PDIF Header (X18)

Connector type: 1×7 Pin Header Male, 2.54mm, not assembled

Table 34: Line IN – S/PDIF Header (X18)

Pin	Signal Name	MXM3 Pin Number	I/O Type	Voltage	Pull-up/Pull-down
1	5V_SW		PWR		
2	SPDIF1_IN	217	I	+3.3V	
3	SPDIF1_OUT	215	O		
4	GND		PWR		
5	AGND		PWR		
6	AAP1_LIN_L	310	I	+3.3V	
7	AAP1_LIN_R	312	I		

3.11 Digital and Analog I/O Interface

3.11.1 UART

Ixora features 4 UART interfaces that are connected to the following connectors:

- UART 1 to the X22 connector through an RS232 transceiver.
- UART 2 to the X21 connector through an RS232 transceiver.
- UART 3 to the X21 connector through an RS232 transceiver and to the connector X27.
- UART 4 to the X27 connector.

It is possible to disconnect the signal UART3_RXD from the RS232 IC12 MAX3243 transceiver by disassembling the JP3 jumper. In addition, it is possible to put the IC12 transceiver in the high impedance state by forcing pin 22 to zero. The value of the GPIO connected to pin 180 of the MXM3 connector.

One of these two configurations is required when the UART3 interface needs to be used on the X27 connector.

3.11.1.1 RS232 Header (X21) Connector type: 2×5 Pin Header Male, 2.54mm

Table 35: RS232 Header (X21)

Pin	Signal Name	I/O Type	Voltage	Pull-up/Pull-down
1	UART3_RS232_RXD	I		
2	NC			
3	UART2_RS232_RXD	I		
4	UART2_RS232_RTS	O		
5	UART2_RS232_TXD	O		
6	UART2_RS232_CTS	I		
7	UART3_RS232_TXD	O		
8	NC			
9	GND			

3.11.1.2 RS232 Header (X22) Connector type: 2×5 Pin Header Male, 2.54mm

Table 36: RS232 Header (X22)

Pin	Signal Name	I/O Type	Voltage	Pull-up/Pull-down
1	UART1_RS232_DCD	I		
2	UART1_RS232_DSR	I		
3	UART1_RS232_RXD	I		
4	UART1_RS232_RTS	O		
5	UART1_RS232_TXD	O		
6	UART1_RS232_CTS	I		
7	UART1_RS232_DTR	O		
8	UART1_RS232_RI	I		
9	GND			

3.11.2 CAN

Ixora uses the Analog Devices ADM3057EBRWZ signal and power CAN FD transceiver to implement two CAN FD interfaces in conjunction with the two CAN interface on the Apalis module. The CAN ports are electrically isolated from the system power supply.

On Ixora V1.2, it is possible to enable/disable CAN1 and CAN2 transceivers. MXM3_158 (MMC1_D7) and MXM3_35 (SATA1_ACT#) can be used to enable/disable power to the CAN1 and CAN2 transceivers respectively. Additionally, the MXM3_200_M and MXM3_204_M pins may be used to control STBY and SILENT pins of the transceivers. Please refer to the Ixora carrier board schematics for more details. The CAN interfaces are available on the X20 header.

3.11.2.1 CAN Header (X20) Connector type: 2×3 Pin Header Male, 2.54mm

Table 37: CAN Header (X20)

Pin	Signal Name	I/O Type	Voltage	Pull-up/Pull-down
1	CAN1_L	I/O	+5V	
2	CAN1_H	I/O	+5V	
3	CAN1_GND_ISO	PWR		
4	CAN2_GND_ISO	PWR		
5	CAN2_H	I/O	+5V	
6	CAN2_L	I/O	+5V	

3.11.3 Extension Header (X27)

Connector type: 2×18 Pin Header Male, 2.54mm

Table 38: Extension Header (X27)

Pin	Signal Name	MXM3 Pin Number	I/O Type	Voltage	Pull-up/Pull-down
1	RESET_MICO#	28	I	+3.3V	

Continued on next page

Table 38: Extension Header (X27) (Continued)

Pin	Signal Name	MXM3 Pin Number	I/O Type	Voltage	Pull-up/Pull-down
2	POWER_ENABLE_MOCI	24	O	+3.3V	
3	WAKE1_MICO#	37	I	+3.3V	10K to 3.3V_SW
4	RESET_MOCI#	26	O	+3.3V	
5	I2C1_SDA	209	I/O	+3.3V	1.8K to 3.3V_SW
6	I2C1_SCL	211	I/O	+3.3V	1.8K to 3.3V_SW
7	GND		PWR		
8	SPI1_CLK	221	I/O	+3.3V	
9	SPI1_CS	227	I/O	+3.3V	
10	SPI1_MISO	223	I	+3.3V	
11	SPI1_MOSI	225	O	+3.3V	
12	5V_SW		PWR	+5V	
13	GPIO1	1	I/O	+3.3V	
14	GPIO2	3	I/O	+3.3V	
15	GPIO3	5	I/O	+3.3V	
16	GPIO4	7	I/O	+3.3V	
17	GPIO5	11	I/O	+3.3V	
18	GPIO6	13	I/O	+3.3V	
19	GPIO7	15	I/O	+3.3V	
20	GPIO8	17	I/O	+3.3V	
21	GND		PWR		
22	AN1_ADC0	305	I	+3.3V1	
23	AN1_ADC1	307	I	+3.3V1	
24	AN1_ADC2	309	I	+3.3V1	
25	AN1_TSWIP_ADC3	311	I	+3.3V1	
26	AGND		PWR		
27	UART3_RXD	136	I	+3.3V	
28	UART3_TXD	134	O	+3.3V	
29	3.3V_SW		PWR	+3.3V	
30	UART4_RXD	140	I	+3.3V	
31	UART4_TXD	138	O	+3.3V	
32	GND		PWR		
33	PWM1	2	O	+3.3V	
34	PWM2	4	O	+3.3V	
35	PWM3	6	O	+3.3V	
36	PWM4	8	O	+3.3V	

[1]Please consult the relevant SoM datasheet for the maximum ADC input voltage.

3.11.4 Camera

Ixora offers a MIPI-CSI and Parallel Camera interface provided by the Apalis Module. These interfaces can be used to capture images and video using CMOS or CDD image sensors. This interface supports a wide variety of operating modes, data widths, formats, and clocking schemes. For details, please see the corresponding Apalis module datasheet.

3.11.4.1 MIPI-CSI Connector (X28) Connector type: Wurth, 687124182122 (24 pin , 0.5mm Pitch)

Table 39: MIPI-CSI Connector (X28)

Pin	Signal Name	MXM3 Pin Number	I/O Type	Voltage	Pull-up/Pull-down
1	GND		PWR		
2	CSI_D0_N	155			
3	CSI_D0_P	157			
4	GND		PWR		
5	CSI_D1_N	149			
6	CSI_D1_P	151			
7	GND		PWR		
8	CSI_CLK_N	161			
9	CSI_CLK_P	163			
10	GND		PWR		
11	CSI_GPIO0_RST	1 (via R150)	I/O	+3.3V	
12	CAM1_MCLK	193	O	+3.3V	
13	I2C_CAM1_SCL	203	O	+3.3V	1.8K to 3.3V_SW
14	I2C_CAM1_SDA	201	I/O	+3.3V	1.8K to 3.3V_SW
15	3.3V_SW		PWR	+3.3V	
16	CSI_D2_N	143			
17	CSI_D2_P	145			
18	GND		PWR		
19	CSI_D3_N	137			
20	CSI_D3_P	139			
21	5V_SW		PWR	+5V	
22	CSI_GPIO1	3 (via R151)	I/O	+3.3V	
23	CSI_GPIO2	5 (via R152)	I/O	+3.3V	
24	CSI_GPIO3	7 (via R153)	I/O	+3.3V	

3.11.4.2 Parallel Camera Interface (X14) Connector type: 2×10 Pin Header Male, 2.54mm

Table 40: Parallel Camera Interface (X14)

Pin	Signal Name	MXM3 Pin Number	I/O Type	Voltage	Pull-up/Pull-down
1	3.3V_SW		PWR		

Continued on next page

Table 40: Parallel Camera Interface (X14) (Continued)

Pin	Signal Name	MXM3 Pin Number	I/O Type	Voltage	Pull-up/Pull-down
2	3.3V_SW		PWR		
3	CAM1_MCLK	193	I/O	+3.3V	
4	CAM1_PCLK	191	I	+3.3V	
5	CAM1_HSYNC	197	I	+3.3V	
6	CAM1_VSYNC	195	I	+3.3V	
7	CAM1_D0	187	I	+3.3V	
8	CAM1_D1	185	I	+3.3V	
9	CAM1_D2	183	I	+3.3V	
10	CAM1_D3	181	I	+3.3V	
11	CAM1_D4	179	I	+3.3V	
12	CAM1_D5	177	I	+3.3V	
13	CAM1_D6	175	I	+3.3V	
14	CAM1_D7	173	I	+3.3V	
15	I2C_CAM1_SCL	203	O	+3.3V	1.8K to 3.3V_SW
16	I2C_CAM1_SDA	201	I/O	+3.3V	1.8K to 3.3V_SW
17	CAM1_D8	135	I	+3.3V	
18	CAM1_D9	159	I	+3.3V	
19	GND		PWR		
20	GND		PWR		

3.11.5 Real-Time Clock (RTC)

3.11.5.0.1 External RTC The Ixora carrier board uses the STMicroelectronics M41T0M6 chip as an external RTC. I2C1 bus (MXM3_209 and MXM3_211) RTC can be assessed the external RTC.

3.11.5.1 Battery Holder (BAT1) A 12 mm (diameter) coin cell/battery should be used with the Battery Holder (BAT1). A coin cell battery can provide power backup to the external RTC circuits when the external power supply is unavailable. The following types of batteries are supported: BR1216, CR1216, BR1220, CL1220, CR1220, BR1225.

Note: The spring contact on the top side of the battery holder sets/bends based on the battery thickness. The spring contact is set if a thicker battery (like BR1225, 2.5mm thickness) is inserted first. Later, when the battery is replaced with a thinner battery (like BR1220, 2.0mm thickness), the battery holder will not hold the replacement battery firmly.
Customers are advised not to use a thinner battery after using a thicker battery in the battery holder (BAT1).

Connector type: KEYSTONE-3000

Table 41: Battery Holder (BAT1)

Pin	Description	Voltage
1	VCC_BATT	+3.0V

Continued on next page

Table 41: Battery Holder (BAT1) (Continued)

Pin	Description	Voltage
2	GND	

3.12 Memory

3.12.1 I2C EEPROM

With Version 1.2, the Ixora carrier board supports an I2C EEPROM. The 2-Kbit AT34C02D is assembled and is connected through the I2C1 bus (MXM3_209 and MXM3_211). The default I2C address is 0xA0. This address can be configured with external pull-up resistors. Floating address pins are connected internally to GND. For Write Protect (WP) features, please consider the datasheet and the schematics. The default configuration allows normal write operations.

3.13 Recovery Mode

Connector type: 1×3 Pin Header Male, 2.54mm, not assembled

Table 42: Recovery Mode Pin Header

Pin	Description
1	1K to 3.3V
2	Recovery Mode
3	GND

For the recovery mode sequence, please refer to the Apalis module datasheet.

4 Electrical Characteristics

4.1 Electrical Specifications

Table 43: Electrical Specifications

Symbol	Description	Voltage	Min	Typ	Max	Unit
PWR_IN_V	Main power supply voltage (PWR_IN)	PWR_IN	7	24	27	V
PWR_IN_I	Main power supply current	PWR_IN	2.2		8	A
V_BACKUP	Optional RTC battery voltage		2	3	3.6	V
I_BACKUP	Optional RTC batter current at 3V (standby)			0.9	1.2	µA
I_(+5V)	Total current for external devices at power rail: X4 Pin 3 X27 Pin 12	+5V			2.5	A
I_(+3.3V)	Total current for external devices at power rail: X4 Pin 1 X27 Pin 29	+3.3V			1.5	A
I_Pin(X27)	Current for single power pin 29 of connector X27	+3.3V		0.5	1.5	A
I_Pin(X4)	Current for single power pin 1 of connector X4	+3.3V		1	1.5	A
I_Pin(X4)	Current for single power pin 3 of connector X4	+5V		1	2.5	A
I_Pin(X27)	Current for single power pin 12 of connector X27	+5V		1	2.5	A
I_Pin(X7)	Current for a single of connector X7	+5V			0.5	A
I_Pin(X8)	Current for a single pin of connector X8	+5V			0.5	A
I_Pin(X9)	Current for a single pin of connector X9	+5V			0.5	A
I_Pin(X27)	Current for single power pin 12 of connector X27	+5V		1	2.5	A
I_Pin(X7)	Current for a single of connector X7	+5V			0.5	A
I_Pin(X8)	Current for a single pin of connector X8	+5V			0.5	A
I_Pin(X9)	Current for a single pin of connector X9	+5V			0.5	A

5 Temperature Range

5.1 Operating Temperature Range ($T_{ambient}$)

- -20 °C to +85 °C

5.2 Storage Temperature Range ($T_{storage}$)

- -20 °C to +85 °C

6 Mechanical Data

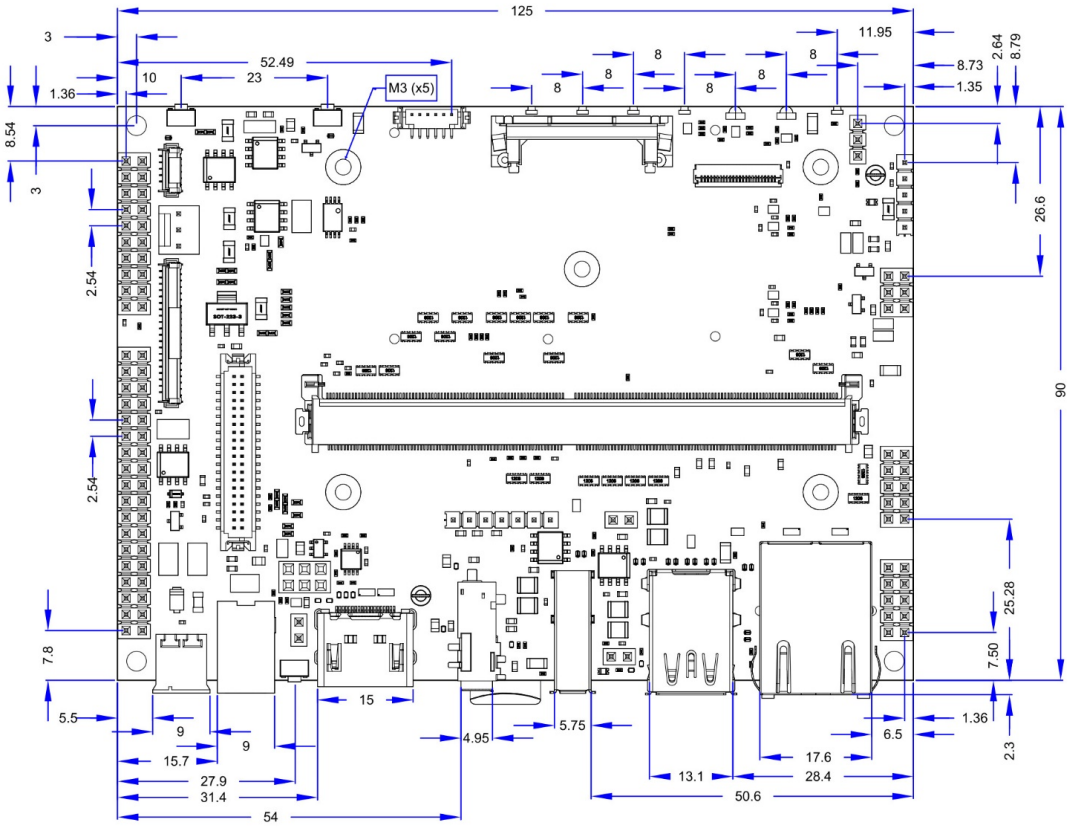

Figure 7: Ixora Carrier Board dimensions (in millimeters) – top side (top view)

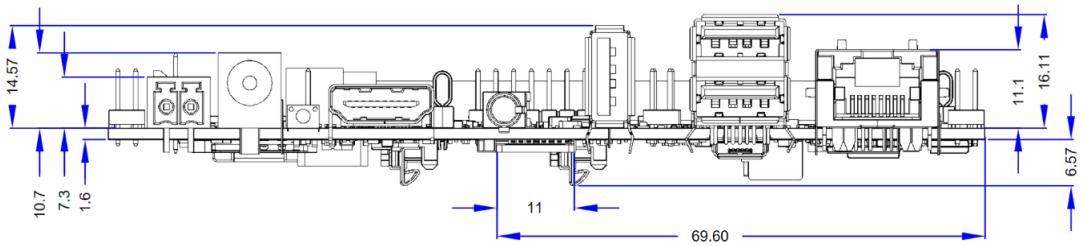

Figure 8: Ixora Carrier Board dimensions (in millimeters) - front side (front view)

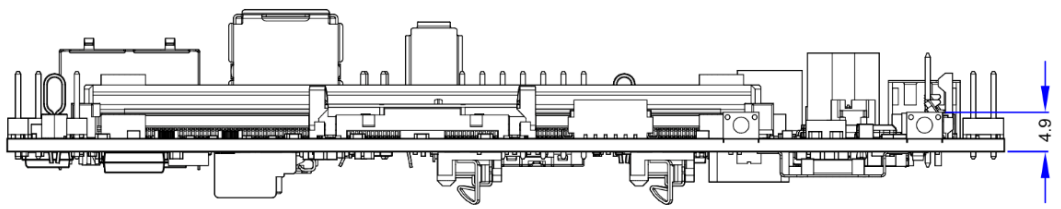

Figure 9: Ixora Carrier Board dimensions (in millimeters) - back side (back view)

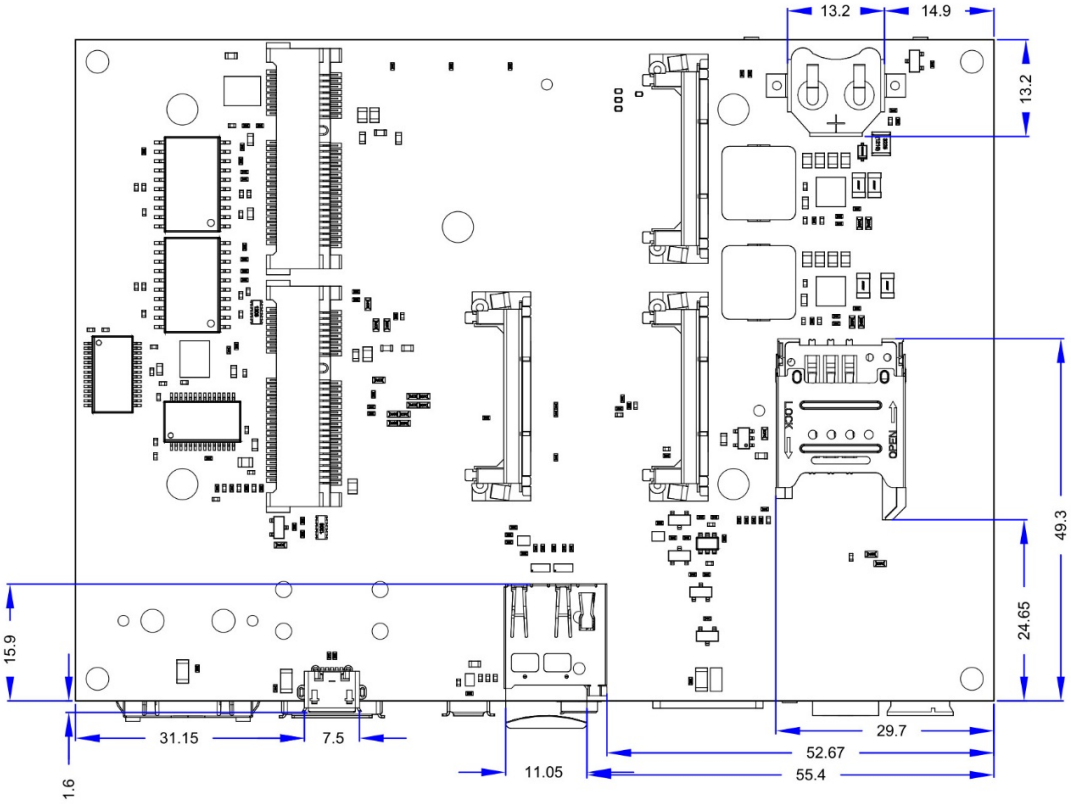

Figure 10: Ixora Carrier Board dimensions (in millimeters) – bottom side (bottom view)

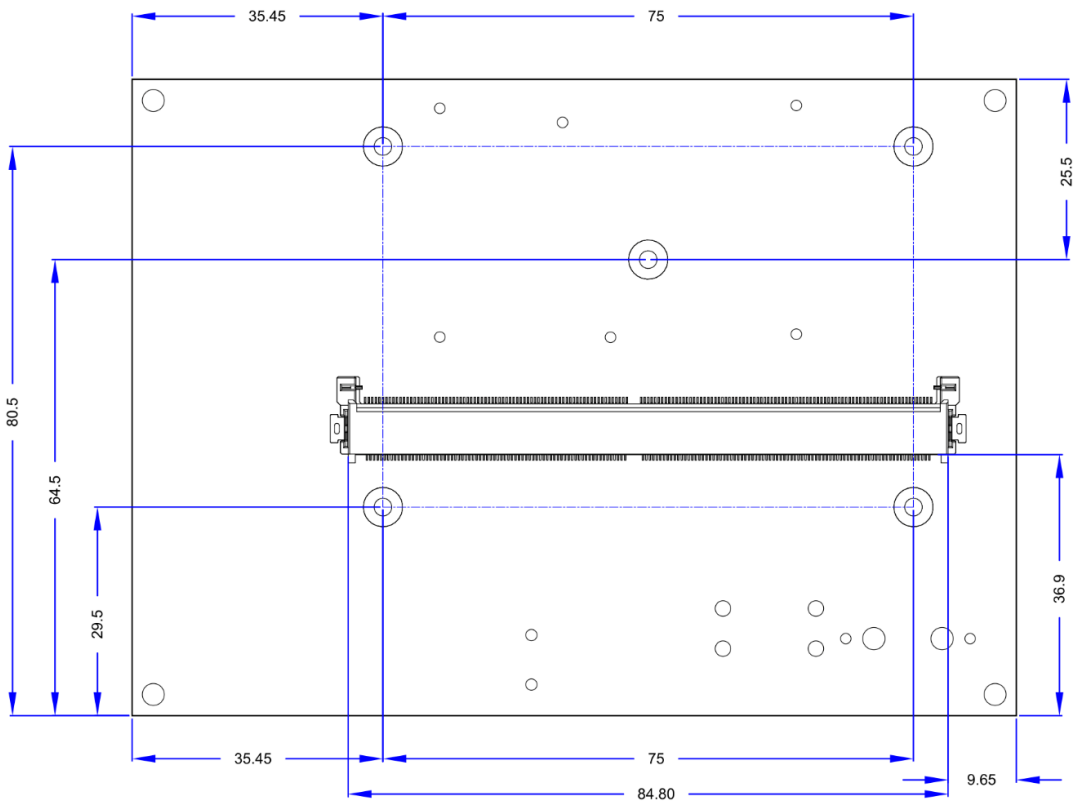

Figure 11: Ixora Carrier Board SoM connector and spacer positions (in millimeters) - top side (top view)

7 Design Data

The design data for Toradex carrier boards are freely available in the Altium Designer format. The design data includes schematics, layout, and component libraries. To download the carrier board design data, please use the web link below:

https://developer.toradex.com/carrier-board-design

8 Product Compliance

Up-to-date information about product compliance such as RoHS, CE, UL-94, Conflict Mineral, REACH, etc. can be found on our website at: https://www.toradex.com/support/product-compliance

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