



XS-2P-X4G3-TBT3-B • XS-2P-X4G3-TBT3-S Thunderbolt 3 adapters

XIMEA Accessories •
Technical Manual •
Version v260903 •

Introductions

About this manual

Dear customer,

Thank you for purchasing a product from XIMEA.

We hope that this manual can answer your questions, but should you have any further queries or if you wish to claim a service or warranty case, please contact your local dealer or refer to XIMEA Support on our website: www.ximea.com/support

The purpose of this document is to provide a description of XIMEA Accessories and to describe the correct way to install related software, drivers and run it successfully. Please read this manual thoroughly before operating your new XIMEA Accessories for the first time. Please follow all instructions and observe the warnings.

This document is subject to change without notice.

About XIMEA

XIMEA is one of the worldwide leaders for innovative camera solutions with a 30-year history of research, development and production of digital image acquisition systems. Based in Slovakia, Germany and the US, with a global distributor network, XIMEA offers their cameras worldwide. In close collaboration with customers XIMEA has developed a broad spectrum of technologies and cutting-edge, highly competitive products.

XIMEA's camera centric technology portfolio comprises a broad spectrum of digital technologies, from data interfaces such as USB 2.0, USB 3.1 and PCIe to cooled digital cameras with CCD, CMOS and sCMOS sensors, as well as X-ray cameras.

XIMEA has three divisions – generic machine vision and integrated vision systems, scientific imaging and OEM/custom.

Our broad portfolio of cameras includes thermally stabilized astronomy and x-ray cameras, as well as specialty cameras for medical applications, research, surveillance and defense.

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1 General description

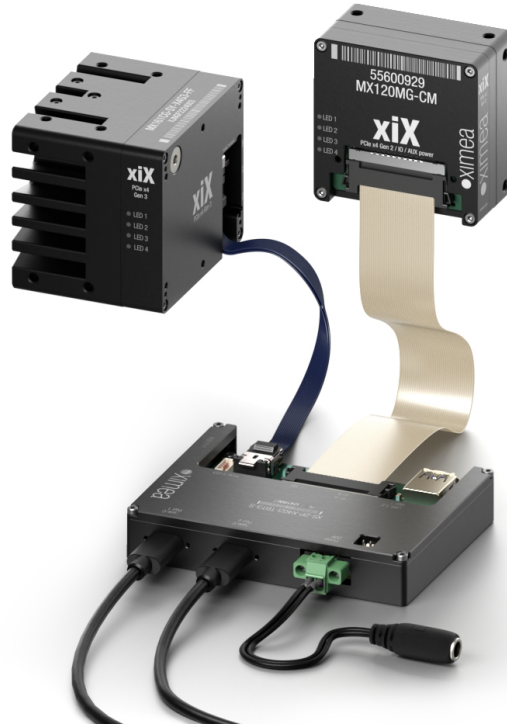


Figure 1: Connected XS-2P-X4G3-TBT3

Product variants

- XS-2P-X4G3-TBT3-B

The Thunderbolt 3 adapter enables seamless connection of PCIe interface cameras (xix family) to a laptop.

XS-2P-X4G3-TBT3-B features two PCIe Gen3 x4 downstream connectors for FireFly and Flex line cables, each providing 32 Gbps bandwidth. Additional connectivity includes a USB 3.0 Type-A port and GPIO connectors for camera integration. With a Thunderbolt 3 host port offering 32 Gbps output bandwidth, the adapter ensures high-speed data transfer and precise camera synchronization.

The bus-powered adapter requires no external power supply, making it an efficient solution for portable imaging applications.

- XS-2P-X4G3-TBT3-S

This Thunderbolt 3 adapter enables the connection of PCIe interface cameras (xix family) to a laptop, featuring two PCIe Gen3 x4 downstream connectors for FireFly and Flex line cables, each with 32 Gbps bandwidth.

XS-2P-X4G3-TBT3-S includes a USB 3.0 Type-A port and additional GPIO connectors for seamless camera integration. With dual Thunderbolt 3 ports and a 32 Gbps host output, the adapter ensures high-speed data transfer and precise camera synchronization.

Powered by an external PSU, it provides a reliable solution for demanding imaging applications.

Note: Connecting a Thunderbolt cable to a standard USB-C port without Thunderbolt support will not work. On Windows systems, some versions require the Thunderbolt Control Center to be installed, and the device must be explicitly authorized in the Thunderbolt Control Center before it can be used.

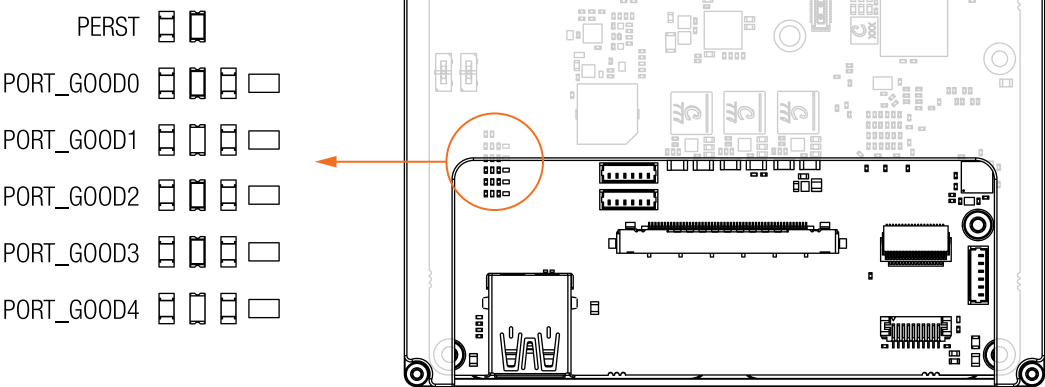


Figure 2: LED location with description

LED	Description
PERST	ON when not active
PORT_GOOD0	Upstream port trained speed
PORT_GOOD1	Downstream port 1 trained speed
PORT_GOOD2	Downstream port 2 trained speed
PORT_GOOD3	Downstream port 3 trained speed
PORT_GOOD4	Downstream port 4 trained speed

Table 1: LED description

2 Dimensional drawings

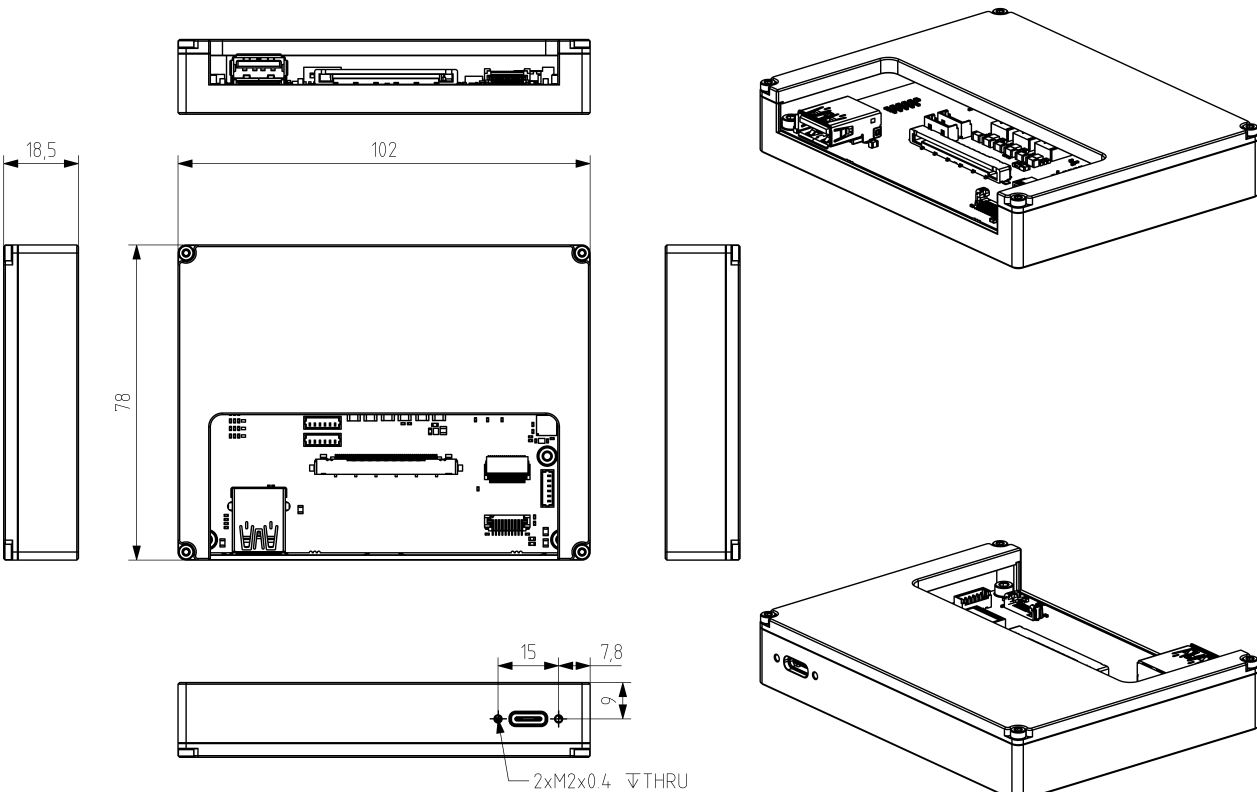


Figure 3: Dimensional drawing of XS-2P-X4G3-TBT3-B

Width [W]	Height [H]	Depth [D]	Mass [M]	Material
102 mm	77 mm	18.5 mm	114 g ¹	Machined Aluminum alloy

¹PCA weight

Table 2: Parameters and mass of XS-2P-X4G3-TBT3-B

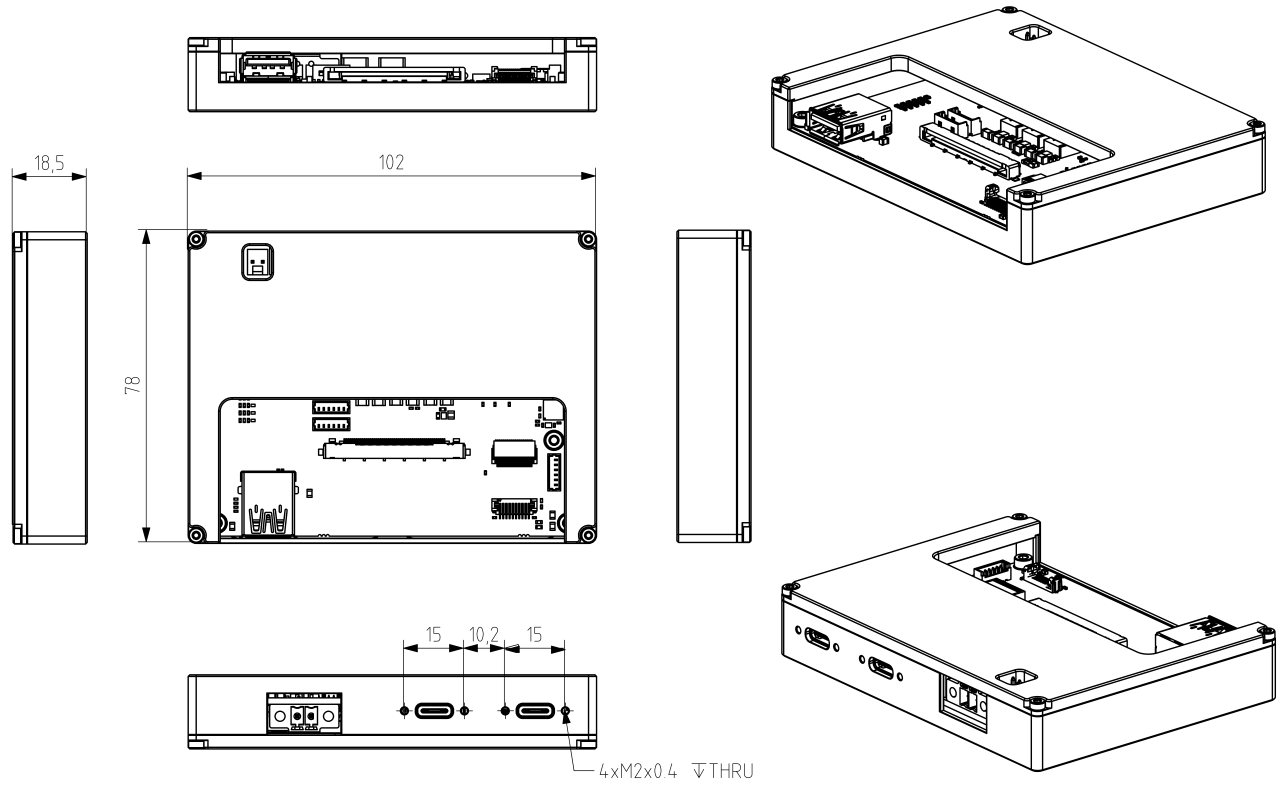


Figure 4: Dimensional drawing of XS-2P-X4G3-TBT3-S

Width [W]	Height [H]	Depth [D]	Mass [M]	Material
102 mm	77 mm	18.5 mm	126 g ¹	Machined Aluminum alloy

¹PCA weight

Table 3: Parameters and mass of XS-2P-X4G3-TBT3-S

3 Configuration

3.1 DIP switches

All host adapters have DIP switches in the same location.

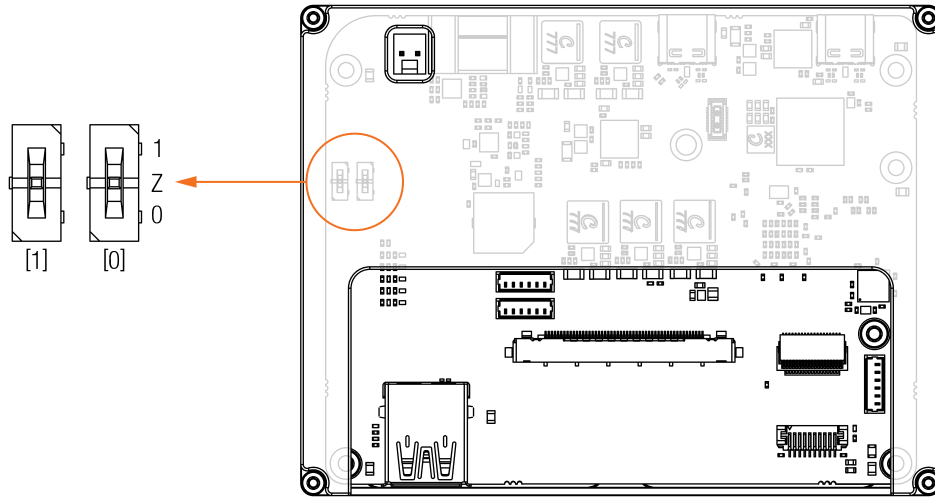


Figure 5: Location of DIP switches

DIP Switch 1 position	DIP Switch 0 position	FF port setting	FCC port setting	Note
Z	Z	single X4G3	single X4G3	Default position
1	Z	dual X2G3	dual X2G3	

Table 4: DIP switches 1 and 0 position

4 Connectors

4.1 Location of connectors

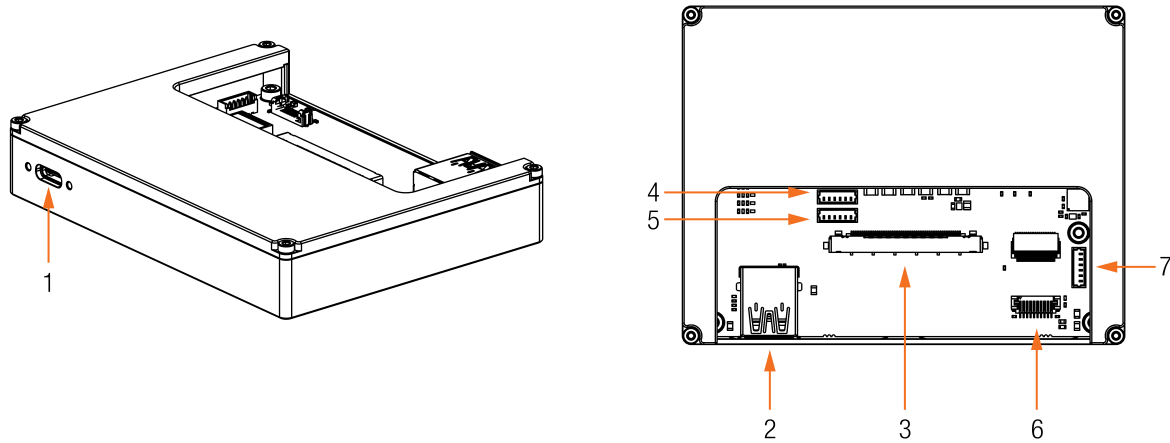


Figure 6: Connectors location of XS-2P-X4G3-TBT3-B

Num.	Connector
1	Port 1, USB Type-C USB 3.1, Thunderbolt 3,
2	USB Type-A 3.2 Gen 1 connector
3	PCIe MX-X4G2, Upstream connector for FFC cable
4	X4G2 IO-B for FFC, Connector Header Through Hole, 6 pos. (1.25 mm)
5	X4G2 IO-A for FFC, Connector Header Through Hole, 6 pos. (1.25 mm)
6	FireFly PCIe X4G3 connector
7	X4G3 IO-A for FF, Connector Header Through Hole, 6 pos. (1.25 mm)

Table 5: Description of connectors for XS-2P-X4G3-TBT3-B

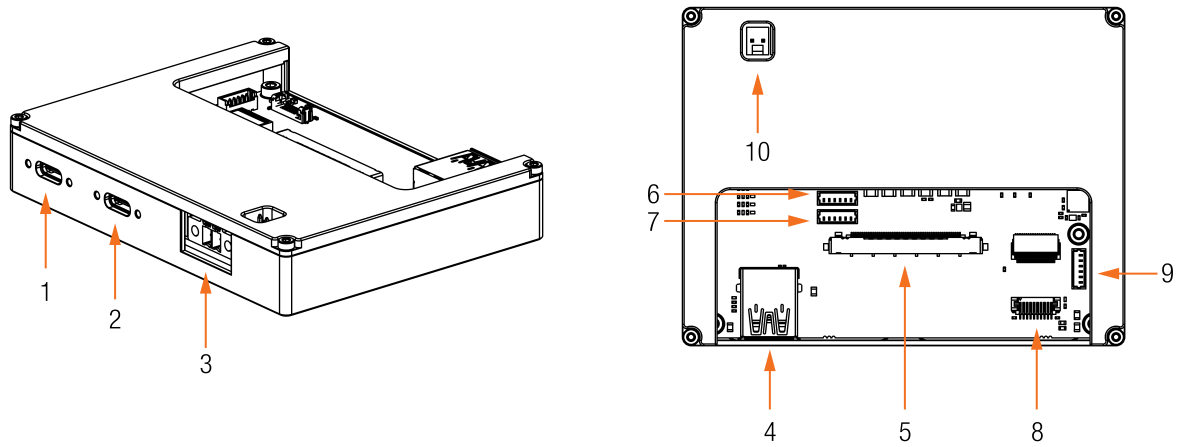


Figure 7: Connectors location of XS-2P-X4G3-TBT3-S

Num.	Connector
1	Port 1, USB Type-C USB 3.1, Thunderbolt 3,
2	Port 2, USB Type-C USB 3.1, Thunderbolt 3,
3	Power connector (12 V - 20 V)
4	USB Type-A 3.2 Gen 1 connector
5	PCIe MX-X4G2, Upstream connector for FFC cable
6	X4G2 IO-B for FFC, Connector Header Through Hole, 6 pos. (1.25 mm)
7	X4G2 IO-A for FFC, Connector Header Through Hole, 6 pos. (1.25 mm)
8	FireFly PCIe X4G3 connector
9	X4G3 IO-A for FF, Connector Header Through Hole, 6 pos. (1.25 mm)
10	Connector TE Connectivity MTA-100 640456-2, 2 pos., (2.54 mm)

Table 6: Description of connectors for XS-2P-X4G3-TBT3-S

4.2 Data interfaces

4.2.1 USB Type-C

Item	Value
Connector	USB Type-C connector 24 Position, receptacle
Signals	PCIe tunneling, USB, Power Delivery
Mating Cable	USB Type-C cable supporting PCIe / high-speed data (Thunderbolt-class)

Table 7: USB Type-C connector general description

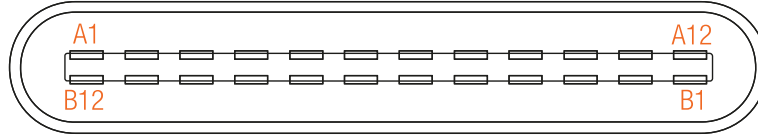


Figure 8: USB Type-C pinout

Pin	Signal	Description	Pin	Signal	Description
A1	GND	Ground return	B12	GND	Ground return
A2	SSTXp1	SuperSpeed differential pair #1, TX, pos.	B11	SSRXp1	SuperSpeed differential pair #2, RX, pos.
A3	SSTXn1	SuperSpeed differential pair #1, TX, neg.	B10	SSRXn1	SuperSpeed differential pair #2, RX, neg.
A4	V-BUS	Bus power	B9	VBUS	Bus power
A5	CC1	Configuration channel	B8	SBU2	Sideband use (SBU)
A6	Dp1	Non-SuperSpeed diff. pair, position 1, pos.	B7	Dn2	Non-SuperSpeed diff. pair, position 2, neg.
A7	Dn1	Non-SuperSpeed diff. pair, position 1, neg.	B6	Dp2	Non-SuperSpeed diff. pair, position 2, pos.
A8	SBU1	Sideband use (SBU)	B5	CC2	Configuration channel
A9	VBUS	Bus power	B4	VBUS	Bus power
A10	SSRXn2	SuperSpeed differential pair #4, RX, neg.	B3	SSTXn2	SuperSpeed differential pair #3, TX, neg.
A11	SSRXp2	SuperSpeed differential pair #4, RX, pos.	B2	SSTXp2	SuperSpeed differential pair #3, TX, pos.
A12	GND	Ground return	B1	GND	Ground return

Table 8: USB type-C connector pin assignment

4.2.2 USB 3.1 Gen1 Type-A

Item	Value
Connector	USB 3.1
Signals	Standard USB 3.1 Gen1 Type-A Connector
Mating Connectors	Standard USB 3.1 Type-A Connector

Table 9: USB Type-A connector general description

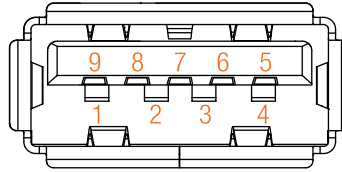


Figure 9: USB3 Type-A pinout

Pin	Signal	Description
1	VBUS	Power supply 5 V
2	D-	USB 2.0 differential data line neg.
3	D+	USB 2.0 differential data line pos.
4	GND	Ground return for power and signal
5	SSRX-	SuperSpeed receive differential pair neg.
6	SSRX+	SuperSpeed receive differential pair pos.
7	GND	Ground return for power and signal
8	SSTX-	SuperSpeed transmit differential pair neg.
9	SSTX+	SuperSpeed transmit differential pair pos.

Table 10: USB Type-A pin assignment

4.2.3 Power connector

If a power connector is installed in the xSwitch, it requires a voltage supply of 12–20 VDC. The connector is a Terminal Block Header with part number 1727566, and its corresponding mating connector is part number 1714977.

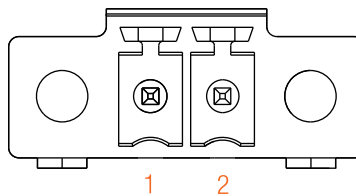


Figure 10: Power Terminal Block Header pinout

Pin	Signal	Description
1	VCC IN	Power input
2	GND	Ground

Table 11: Power Terminal Block Header pin assignment

4.2.4 FFC cable connector

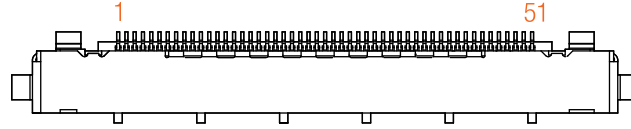


Figure 11: PCIe MX-X4G2 Upstream connector pinout

Pin	Name	Signal	Pin	Name	Signal
1	GND	Ground return	27	PWR	Power input
2	OUT1	Opto- isolated Output 1	28	GND	Ground return
3	IN_OUT_GND	Ground for opto-isolated Outputs	29	PCle_PERN_3	PCle RX differential pair 3
4	OUT2	Opto- isolated Output 2	30	PCle_PERP_3	PCle RX differential pair 3
5	GND	Ground return	31	GND	Ground return
6	INOUT4	Non-isolated I/O	32	PCle_PERN_2	PCle RX differential pair 2
7	INOUT3	Non-isolated I/O	33	PCle_PERP_2	PCle RX differential pair 2
8	PCle_RST0_N_IN	PCle reset	34	GND	Ground return
9	GND	Ground return	35	PCle_PERN_1	PCle RX differential pair 1
10	PCle_REFCLK_N	PCle reference clock diff. pair	36	PCle_PERP_1	PCle RX differential pair 1
11	PCle_REFCLK_P	PCle reference clock diff. pair	37	GND	Ground return
12	GND	Ground return	38	PCle_PERN_0	PCle RX differential pair 0
13	PCle_PETN_3	PCle TX differential pair 3	39	PCle_PERP_0	PCle RX differential pair 0
14	PCle_PETP_3	PCle TX differential pair 3	40	GND	Ground return
15	GND	Ground return	41	NC	
16	PCle_PETN_2	PCle TX differential pair 2	42	NC	
17	PCle_PETP_2	PCle TX differential pair 2	43	GND	Ground return
18	GND	Ground return	44	NC	
19	PCle_PETN_1	PCle TX differential pair 1	45	INOUT2	Non-isolated I/O
20	PCle_PETP_1	PCle TX differential pair 1	46	INOUT1	Non-isolated I/O
21	GND	Ground return	47	GND	Ground return
22	PCle_PETN_0	PCle TX differential pair 0	48	IN2	Opto-isolated Input 2
23	PCle_PETP_0	PCle TX differential pair 0	49	IN_OUT_GND	Ground for opto-isolated Inputs
24	GND	Ground return	50	IN1	Opto-isolated Input 1
25	PWR	Power input	51	GND	External grounds for PWR and non-isolated I/O
26	PWR	Power input			

Table 12: PCIe MX-X4G2 Upstream connector pin assignment

4.2.5 GPIO PCIe X4G2

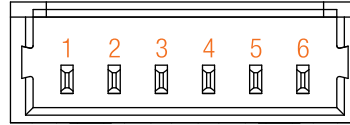


Figure 12: X4G2 IO-A-B pinout

Pin	Signal	Description
1	ISO GPI1	Digital Input
2	IN_GND	Ground for Input
3	ISO GPI2	Digital Input
4	ISO GP01	Digital Output
5	OUT_GND	Ground for Output
6	ISO GP02	Digital Output

Table 13: X4G2 IO-A pin assignment

Pin	Signal	Description
1	INOUT1	Digital Input/Output
2	GND	Ground
3	INOUT2	Digital Input/Output
4	INOUT3	Digital Input/Output
5	GND	Ground
6	INOUT4	Digital Input/Output

Table 14: X4G2 IO-B pin assignment

4.2.6 FireFly connector

Item	Value
Connector	Samtec (UEC5-019-1-H-D-RA-1-A + UCC8-010-1-H-S-1-A)
Signals	PCIe, IO, GND
Mating cables	Ximea PN: CBL-ECUE-X4G3-1M0, CBL-ECUE-X4G3-2M0

Table 15: FireFly connector description

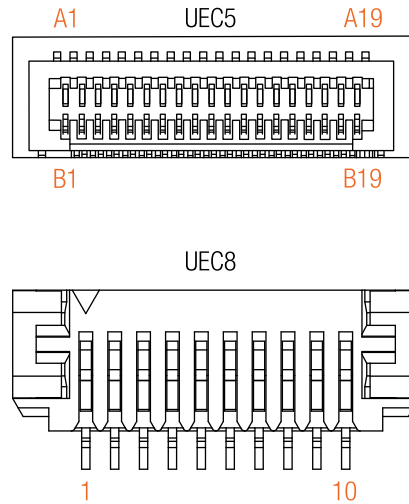


Figure 13: Firefly connector pinout

Pin	Name	Description
1	VCC_TX	TX Power output
2	GND	Ground
3	PRESENTL	Module presence detect
4	SELECT	Signal for selection
5	CPERST	PCIe reset signal
6	CPRSNT	Card presence detect
7	SDA	I2C data line
8	SCL	I2C clock line
9	GND	Ground
10	VCC_RX	RX power output

Table 16: FireFly connector UCC8 pin assignment

Pin	Name	Description	Pin	Name	Description
A1	GND	Signal and power ground	B1	GND	Signal and power ground
A2	PCle_PETN_2	PCle TX differential pair 2	B2	PCle_PETN_3	PCle TX differential pair 3
A3	PCle_PETP_2	PCle TX differential pair 2	B3	PCle_PETP_3	PCle TX differential pair 3
A4	GND	Signal	B4	GND	Signal and power ground
A5	PCle_PETN_1	PCle TX differential pair 1	B5	PCle_PETN_0	PCle TX differential pair 0
A6	PCle_PETP_1	PCle TX differential pair 1	B6	PCle_PETP_0	PCle TX differential pair 0
A7	GND	Signal and power ground	B7	GND	Signal and power ground
A8	SPARE	Unused/reserved pin	B8	PWR	Power input
A9	CPERST	PCle reset signal	B9	PWR	Power input
A10	GND	Signal and power ground	B10	GND	Signal and power ground
A11	ISO_GND	Isolated Ground	B11	ISO_GND	Isolated Ground
A12	ISO_GPI	Isolated Input	B12	ISO_GPO	Isolated Output
A13	GND	Signal and power ground	B13	GND	Signal and power ground
A14	PCle_PERP_2	PCle RX differential pair 2	B14	PCle_PERN_3	PCle RX differential pair 3
A15	PCle_PERN_2	PCle RX differential pair 2	B15	PCle_PERP_3	PCle RX differential pair 3
A16	GND	Signal and power ground	B16	GND	Signal and power ground
A17	PCle_PERP_1	PCle RX differential pair 1	B17	PCle_PERN_0	PCle RX differential pair 0
A18	PCle_PERN_1	PCle RX differential pair 1	B18	PCle_PERP_0	PCle RX differential pair 0
A19	GND	Signal and power ground	B19	GND	Signal and power ground

Table 17: FireFly connector UEC5 pin assignment

4.2.7 GPIO PCIe X4G3

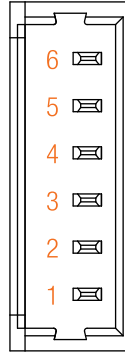


Figure 14: X4G3 IO-A pinout

Pin	Signal	Description
1	ISO GPI1	Digital Input
2	GPI_GND	Ground for Input
3	None	None
4	ISO GPO1	Digital Output
5	GPO_GND	Ground for Output
6	None	None

Table 18: X4G3 IO-A pin assignment

4.2.8 Connector TE Connectivity MTA-100 640456-2

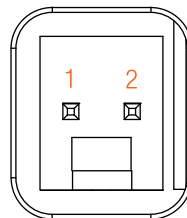


Figure 15: TE Connectivity MTA-100 640456-2 pinout

Pin	Signal	Description
1	GND	Ground
2	VCC IN	Power input

Table 19: TE Connectivity MTA-100 640456-2 pin assignment

5 Quickstart guide

5.1 Hardware setup

5.1.1 Essential components

It is important that the power is turned off when inserting/detaching the cables. General ESD precautions need to be applied. Failing this requirement may lead to product damage.

- Thunderbolt cable
- Interface cable to the device you want to connect (FFC X4G2 / FireFly FF)
- Device you want to connect

5.1.2 Connecting the components

Step 1. Connect the target device with the required cable (e.g. a camera or an adapter with FF/FCC cable)

Step 2. Connect the computer through any of Thunderbolt 3 ports with Thunderbolt 3 cable

Step 3. If the power connector is installed, connect it to the appropriate voltage supply

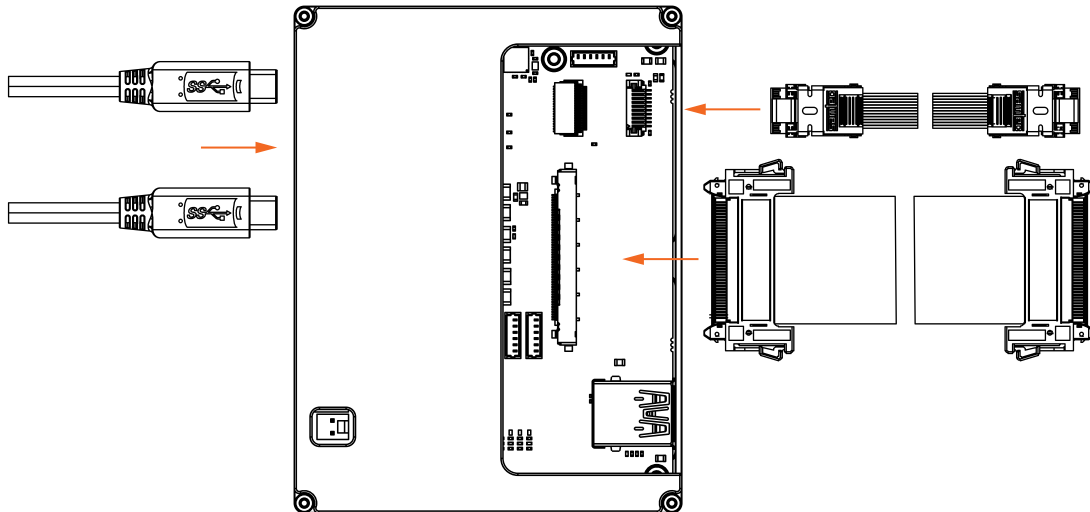


Figure 16: Cable connection XS-2P-X4G3-TBT3

For more information about XS-2P-X4G3-TBT3 please contact: sales@ximea.com.

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