



FRONTGRADE

ADV PRODUCT BRIEF

IOM

Input Output XMC Mezzanine

8/27/2024
Version 1.0.2

Introduction

The Frontgrade Input Output XMC Mezzanine (IOM) provides an easy way for an FPGA or Processor to extend their IO to the outside world. The IOM uses space rated components to convert internal signals levels to external I/O. The Mezzanine complies to the XMC physical form factor and translates signals from the P15/P16 connectors to Glenair Nano-D front panel connectors. The IOM is specially designed to plug directly onto Frontgrade's Reconfigurable Processing Module (RPM)

Input Output XMC Mezzanine : IOM

Features

Data Rates / Connectivity

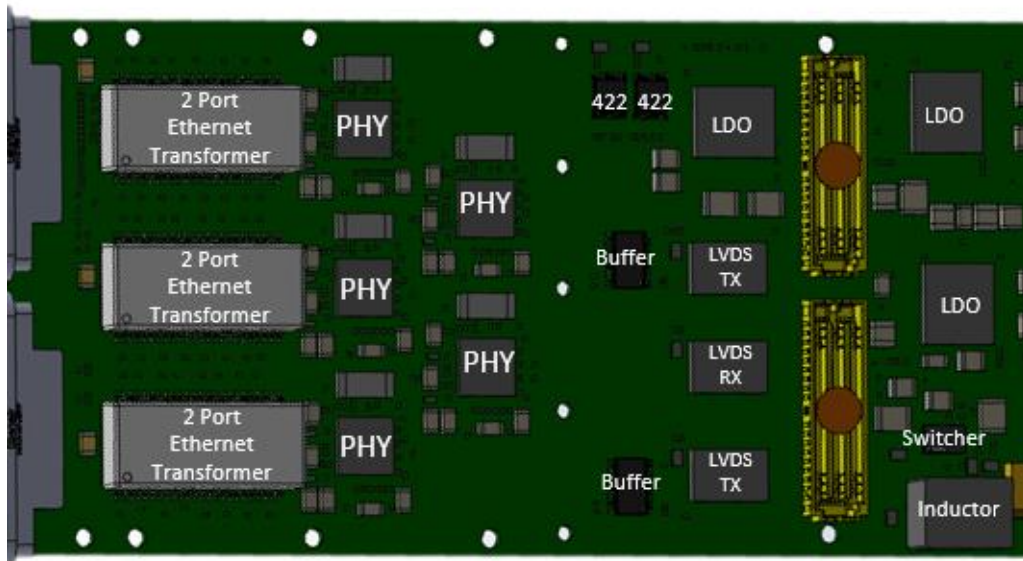
- Five 100Base-TX/1000Base-T PHY's, with RGMII presented to the base card
- Four SpaceWire level translators of up to 200 Mbps per port, with single ended I/O presented to the base card
- Three RS422 input level translators, with single ended I/O presented to the base card
- One RS422 Output level translator, with single ended I/O from the base card
- Discrete IOs:
 - 3 LVDS input level translators, with single ended I/O presented to the base card
 - 1 LVDS output level translator, with single ended I/O from the base card
 - 1 LVTTTL/LVCMOS input level translator, with 1.5V I/O presented to the base card
 - 4 LVTTTL/LVCMOS output level translators, with 1.5V I/O from the base card

Mass / Volume / Thermal

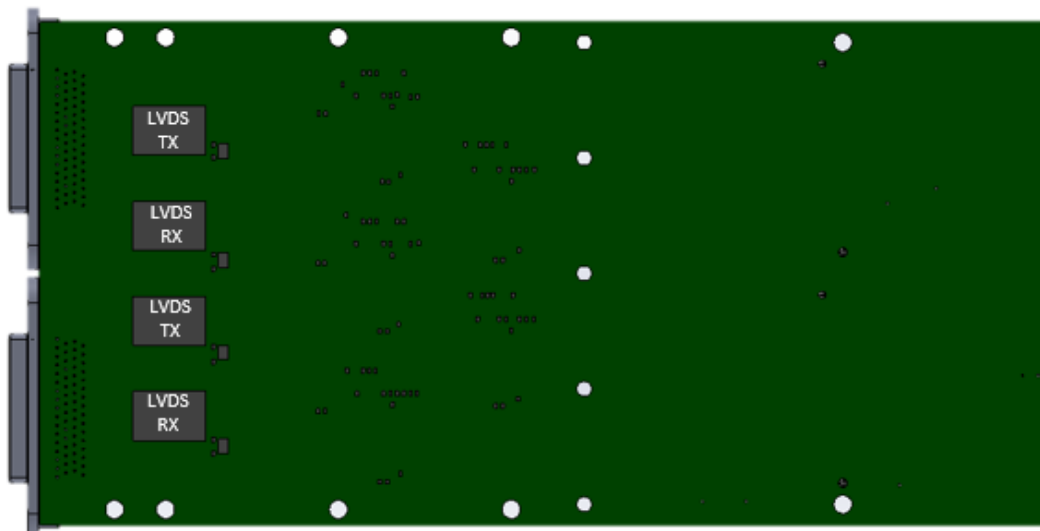
- Mass: less than 125 grams (estimated), standard XMC form factor
- Maximum Component operating temperature: 125°C
- Maximum power consumption: 7W

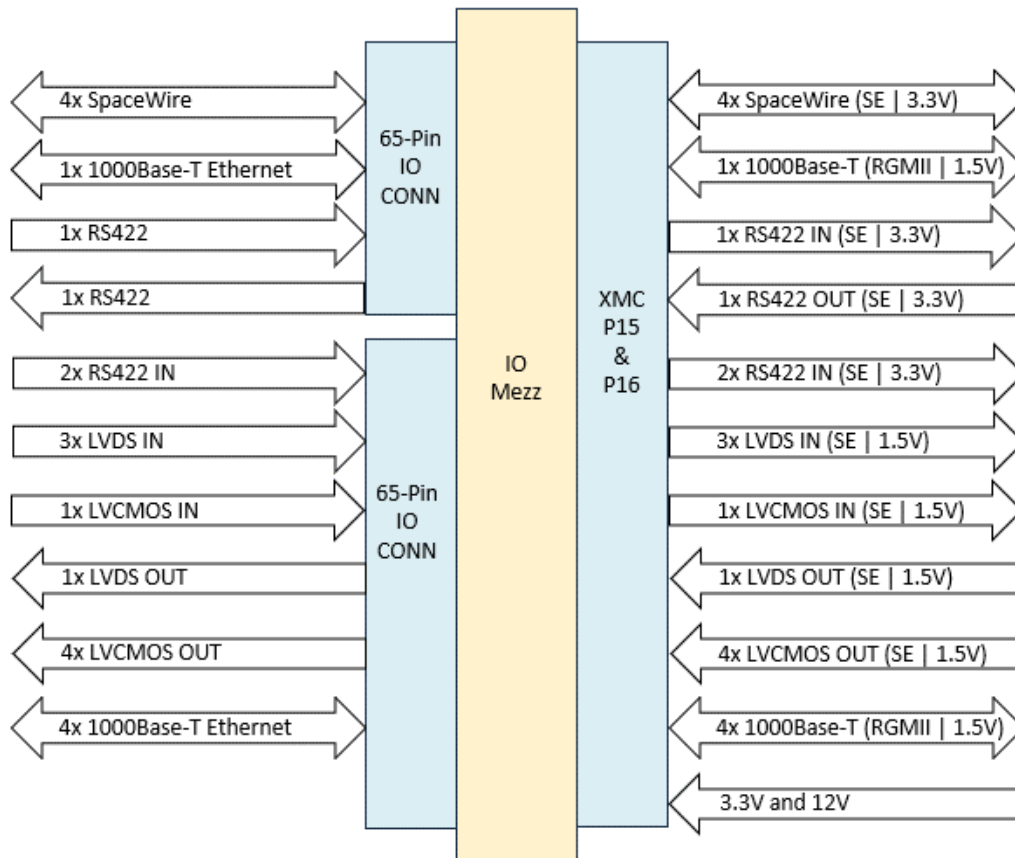
Operational Life / Reliability And Performance

- MTBF Per MIL-HDBK-217F Notice 2 is 2,404,814 hours at 55°C at card edge
- System SEU rate: No more than one per year for typical LEO Missions
- TID of 25 krad (Si) or 100 krad (Si) optional assuming 100 mils of shielding with 6061-T6 Aluminum
- NASA PEM-INST-001 Level-2 parts pedigree available



Frontgrade IO XMC Mezzanine





Frontgrade IO XMC Mezzanine Connector

P15 IOM XMC Connector

P15 Socket		Signal Assignment Connector Part Number: ASP-212942-01	
A1	LVDS_IN_1 (SE 1.5V)	B1	NC
A2	GND	B2	GND
A3	LVDS_IN_2 (SE 1.5V)	B3	NC
A4	GND	B4	GND
A5	LVDS_IN_3 (SE 1.5V)	B5	NC
A6	GND	B6	GND
A7	LVDS_OUT_1 (SE 1.5V)	B7	NC
A8	GND	B8	GND
A9	DNC	B9	NC
A10	GND	B10	GND
A11	LVC MOS_IN_1 (SE 1.5V)	B11	NC
A12	GND	B12	GND
A13	DNC	B13	NC
A14	GND	B14	GND
A15	NC	B15	NC
A16	GND	B16	GND
A17	ETH_RESET_N_5 (1.5V)	B17	NC
A18	GND	B18	GND
A19	ETH_RESET_N_4 (1.5V)	B19	ETH_RESET_N_2 (1.5V)
D1	NC	E1	NC
D2	GND	E2	GND
D3	NC	E3	NC
D4	GND	E4	GND
D5	NC	E5	NC
D6	GND	E6	GND
D7	NC	E7	NC
D8	GND	E8	GND
D9	DNC	E9	NC
D10	GND	E10	GND
D11	NC	E11	NC
D12	GND	E12	GND
D13	NC	E13	NC
D14	GND	E14	GND
D15	NC	E15	NC
D16	GND	E16	GND
D17	NC	E17	NC
D18	GND	E18	GND

P15 Socket		Signal Assignment Connector Part Number: ASP-212942-01	
D19	ETH_RESET_N_2 (1.5V)	E19	ETH_RESET_N_3 (1.5V)
C1	+3.3V	F1	+12V
C2	SpaceWire_SIN_3 (SE 3.3V)	F2	NC
C3	+3.3V	F3	+12V
C4	SpaceWire_DIN_3 (SE 3.3V)	F4	NC
C5	+3.3V	F5	+12V
C6	SpaceWire_SOUT_3 (SE 3.3V)	F6	+12V
C7	+3.3V	F7	+12V
C8	SpaceWire_DOUT_3 (SE 3.3V)	F8	NC
C9	SpaceWire_SIN_2 (SE 3.3V)	F9	+12V
C10	SpaceWire_DIN_2 (SE 3.3V)	F10	NC
C11	NC	F11	+12V
C12	NC	F12	GND
C13	+3.3V	F13	+12V
C14	NC	F14	NC
C15	NC	F15	+12V
C16	NC	F16	NC
C17	NC	F17	NC
C18	SpaceWire_SIN_4 (SE 3.3V)	F18	SpaceWire_SOUT_4 (SE 3.3V)
C19	SpaceWire_DIN_4 (SE 3.3V)	F19	SpaceWire_DOUT_4 (SE 3.3V)

P16 IOM XMC Connector

P16 Socket		Signal Assignment Connector Part Number: ASP-212942-01	
A1	ETH4_RXD0 (1.5V)	B1	ETH4_TXD0 (1.5V)
A2	GND	B2	GND
A3	ETH4_RXD1 (1.5V)	B3	ETH4_TXD1 (1.5V)
A4	GND	B4	GND
A5	ETH4_RXD2 (1.5V)	B5	ETH4_TXD2 (1.5V)
A6	GND	B6	GND
A7	ETH4_RXD3 (1.5V)	B7	ETH4_TXD3 (1.5V)
A8	GND	B8	GND
A9	ETH4_RXD_CTL (1.5V)	B9	ETH4_TX_CTL (1.5V)
A10	GND	B10	GND
A11	ETH4_RXD_CLK (1.5V)	B11	ETH4_TX_CLK (1.5V)
A12	GND	B12	GND
A13	LVC MOS_OUT_1 (1.5V)	B13	LVC MOS_OUT_2 (1.5V)

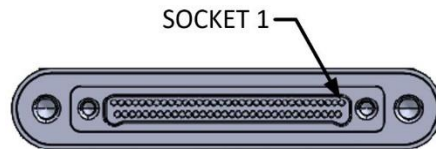
P16 Socket		Signal Assignment Connector Part Number: ASP-212942-01	
A14	GND	B14	GND
A15	RS-422_IN_1 (SE 3.3V)	B15	RS-422_OUT_1 (SE 3.3V)
A16	GND	B16	GND
A17	SpaceWire_SOUT_1 (SE 3.3V)	B17	SpaceWire_SOUT_2 (SE 3.3V)
A18	GND	B18	GND
A19	SpaceWire_DOUT_1 (SE 3.3V)	B19	SpaceWire_DOUT_2 (SE 3.3V)
D1	ETH5_RXD0 (1.5V)	E1	ETH5_TXD0 (1.5V)
D2	GND	E2	GND
D3	ETH5_RXD1 (1.5V)	E3	ETH5_TXD1 (1.5V)
D4	GND	E4	GND
D5	ETH5_RXD2 (1.5V)	E5	ETH5_TXD2 (1.5V)
D6	GND	E6	GND
D7	ETH5_RXD3 (1.5V)	E7	ETH5_TXD3 (1.5V)
D8	GND	E8	GND
D9	ETH5_RXD_CTL (1.5V)	E9	ETH5_TX_CTL (1.5V)
D10	GND	E10	GND
D11	ETH5_RXD_CLK (1.5V)	E11	ETH5_TX_CLK (1.5V)
D12	GND	E12	GND
D13	LVC MOS_OUT_3 (1.5V)	E13	LVC MOS_OUT_4 (1.5V)
D14	GND	E14	GND
D15	SpaceWire_SIN_1 (SE 3.3V)	E15	RS-422_IN_2 (SE 3.3V)
D16	GND	E16	GND
D17	SpaceWire_DIN_1 (SE 3.3V)	E17	RS-422_IN_3 (SE 3.3V)
D18	GND	E18	GND
D19	DNC	E19	DNC
C1	ETH1_TXD0 (1.5V)	F1	ETH2_TXD0 (1.5V)
C2	ETH1_TXD1 (1.5V)	F2	ETH2_TXD1 (1.5V)
C3	ETH1_TXD2 (1.5V)	F3	ETH2_TXD2 (1.5V)
C4	ETH1_TXD3 (1.5V)	F4	ETH2_TXD3 (1.5V)
C5	ETH1_TX_CLK (1.5V)	F5	ETH2_TX_CLK (1.5V)
C6	ETH1_TX_CTL (1.5V)	F6	ETH2_TX_CTL (1.5V)
C7	ETH1_RXD0 (1.5V)	F7	ETH2_RXD0 (1.5V)
C8	ETH1_RXD1 (1.5V)	F8	ETH2_RXD1 (1.5V)
C9	ETH1_RXD2 (1.5V)	F9	ETH2_RXD2 (1.5V)
C10	ETH1_RXD3 (1.5V)	F10	ETH2_RXD3 (1.5V)
C11	ETH1_RX_CLK (1.5V)	F11	ETH2_RX_CLK (1.5V)
C12	ETH1_RX_CTL (1.5V)	F12	ETH2_RX_CTL (1.5V)
C13	ETH3_TXD0 (1.5V)	F13	ETH3_RXD0 (1.5V)

P16 Socket		Signal Assignment Connector Part Number: ASP-212942-01	
C14	ETH3_TXD1 (1.5V)	F14	ETH3_RXD1 (1.5V)
C15	ETH3_TXD2 (1.5V)	F15	ETH3_RXD2 (1.5V)
C16	ETH3_TXD3 (1.5V)	F16	ETH3_RXD3 (1.5V)
C17	ETH3_TX_CLK (1.5V)	F17	ETH3_RX_CLK (1.5V)
C18	ETH3_TX_CTL (1.5V)	F18	ETH3_RX_CTL (1.5V)
C19	ETH_MDIO_DAT (1.5V)	F19	ETH_MDIO_CLK (1.5V)

J3 Mezzanine Front Panel Connector

J3 Mezzanine Socket		65 Pin Signal Assignments Connector Part Number: 891-028-65SS-BRT3T-02-186	
1	GND	34	GND
2	Ethernet Port 2	35	GND
3	Ethernet Port 2	36	Ethernet Port 1
4	Ethernet Port 2	37	Ethernet Port 1
5	Ethernet Port 2	38	GND
6	GND	39	Ethernet Port 1
7	GND	40	Ethernet Port 1
8	Ethernet Port 2	41	GND
9	Ethernet Port 2	42	LVDS IN+ 1
10	Ethernet Port 2	43	LVDS IN- 1
11	Ethernet Port 2	44	LVDS IN+ 2
12	GND	45	LVDS IN- 2
13	GND	46	LVDS IN+ 3
14	Ethernet Port 3	47	LVDS IN- 3
15	Ethernet Port 3	48	LVDS OUT+ 1
16	Ethernet Port 3	49	LVDS OUT- 1
17	Ethernet Port 3	50	GND
18	GND	51	GND
19	Ethernet Port 3	52	LVCMOS IN 1 (3.3V)
20	Ethernet Port 3	53	LVCMOS OUT 3 (3.3V)
21	Ethernet Port 3	54	LVCMOS OUT 1 (3.3V)
22	Ethernet Port 3	55	GND
23	GND	56	LVCMOS OUT 2 (3.3V)
24	Ethernet Port 4	57	LVCMOS OUT 4 (3.3V)
25	Ethernet Port 4	58	RS-422 IN+ 2
26	GND	59	Ethernet Port 4
27	Ethernet Port 4	60	RS-422 IN- 2
28	GND	61	GND
29	GND	62	RS-422 IN+ 3

J3 Mezzanine Socket	65 Pin Signal Assignments Connector Part Number: 891-028-65SS-BRT3T-02-186		
30	Ethernet Port 4	63	GND
31	Ethernet Port 4	64	RS-422 IN- 3
32	Ethernet Port 4	65	GND
33	Ethernet Port 4		



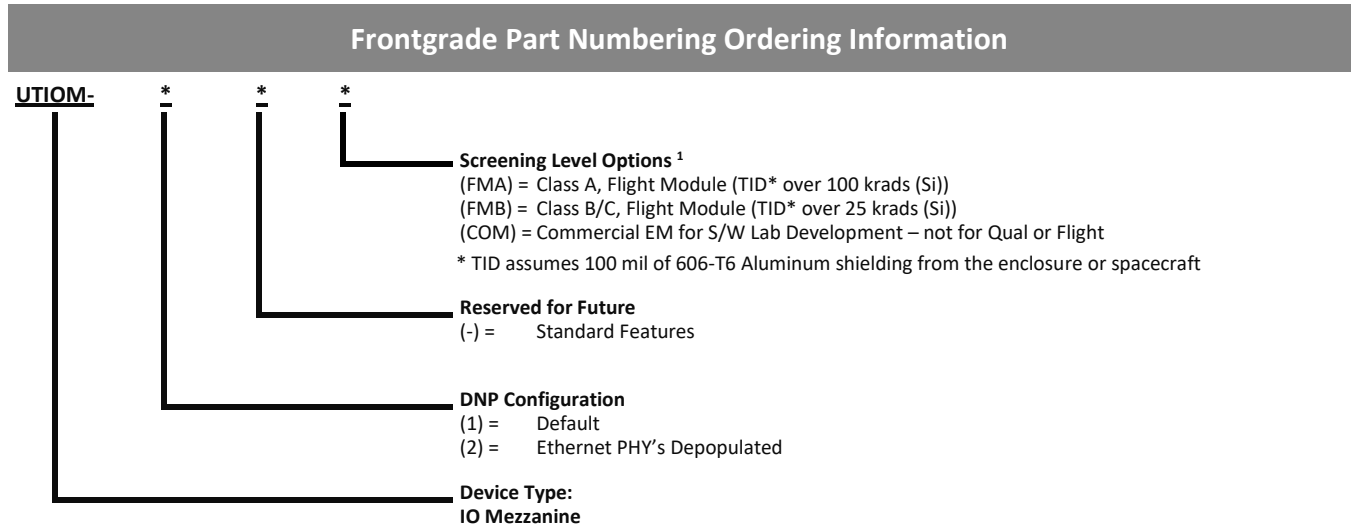
J3 and J4 Connector Pin Orientation for the 65-Pin Front Panel Mezzanine Connectors (View from the Front of the Card)

J4 Mezzanine Front Panel Connector

J4 Mezzanine Socket	65 Pin SpaceWire, RS422, UART, 1000BASE-T Signal Assignment Connector Part Number: 891-028-65SS-BRT3T-02-186		
1	GND	34	GND
2	GND	35	SpaceWire 1
3	Ethernet Port 5	36	SpaceWire 1
4	Ethernet Port 5	37	SpaceWire 1
5	Ethernet Port 5	38	SpaceWire 1
6	Ethernet Port 5	39	GND
7	GND	40	GND
8	GND	41	SpaceWire 1
9	Ethernet Port 5	42	SpaceWire 1
10	Ethernet Port 5	43	SpaceWire 1
11	Ethernet Port 5	44	SpaceWire 1
12	Ethernet Port 5	45	GND
13	GND	46	SpaceWire 2
14	SpaceWire 3	47	SpaceWire 2
15	SpaceWire 3	48	SpaceWire 2
16	GND	49	SpaceWire 2
17	SpaceWire 3	50	GND
18	SpaceWire 3	51	GND
19	GND	52	SpaceWire 2
20	SpaceWire 3	53	SpaceWire 2
21	SpaceWire 3	54	GND
22	SpaceWire 3	55	SpaceWire 2
23	SpaceWire 3	56	SpaceWire 2

J4 Mezzanine Socket	65 Pin SpaceWire, RS422, UART, 1000BASE-T Signal Assignment Connector Part Number: 891-028-65SS-BRT3T-02-186		
24	GND	57	GND
25	SpaceWire 4	58	RS-422 OUT- 1
26	SpaceWire 4	59	GND
27	SpaceWire 4	60	RS-422 OUT+ 1
28	SpaceWire 4	61	GND
29	GND	62	RS-422 IN- 1
30	SpaceWire 4	63	GND
31	SpaceWire 4	64	RS-422 IN+ 1
32	SpaceWire 4	65	GND
33	SpaceWire 4		

Ordering Information



Notes:

1. Screening Level Options (FMA, FMB, or COM) must be specified.

Revision History

Date	Revision #	Author	Change Description	Page #
5/19/24	1.0.0	Kevin.Caster@Frontgrade.com	Advanced Product Brief – initial release and data is subject to change	All
5/19/24	1.0.1	Kevin.Caster@Frontgrade.com	Added MTBF Data	All
8/27/24	1.0.2	TLM	Editorial updates and formatting changes throughout. Sheet 12: Replaced export-controlled note with unlimited distribution statement	All

Datasheet Definitions

	Definition
Advanced Datasheet	Frontgrade reserves the right to make changes to any products and services described herein at any time without notice. The product is still in the development stage and the datasheet is subject to change . Specifications can be TBD and the part package and pinout are not final .
Preliminary Datasheet	Frontgrade reserves the right to make changes to any products and services described herein at any time without notice. The product is in the characterization stage and prototypes are available.
Datasheet	Product is in production and any changes to the product and services described herein will follow a formal customer notification process for form, fit or function changes.

Frontgrade Technologies Proprietary Information Frontgrade Technologies (Frontgrade or Company) reserves the right to make changes to any products and services described herein at any time without notice. Consult a Frontgrade sales representative to verify that the information contained herein is current before using the product described herein. Frontgrade does not assume any responsibility or liability arising out of the application or use of any product or service described herein, except as expressly agreed to in writing by the Company; nor does the purchase, lease, or use of a product or service convey a license to any patent’s rights, copyrights, trademark rights, or any other intellectual property rights of the Company or any third party.

Distribution Statement A: Approved for public release. Distribution is unlimited.