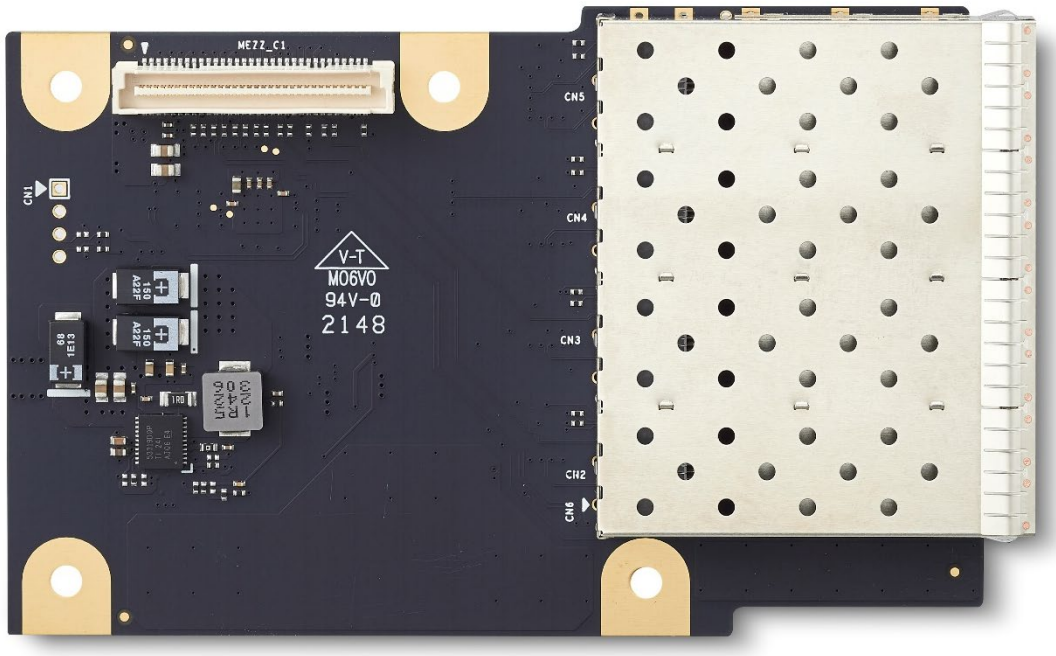
OCP-4x10G-SFP+

User's Guide

11/24/2022-
12/24/2022



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Preface

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Safety Instructions

For user safety, please read and follow all Instructions, **WARNING**s, **CAUTION**s, and **NOTE**s marked in this manual and on the associated equipment before handling/operating the equipment.

Read these safety instructions carefully.

- Keep this manual for future reference.
- Read the specifications section of this manual for detailed information on the operating environment of this equipment.
- Turn off power and unplug any power cords/cables when installing/mounting or un-installing/removing equipment.
- To avoid electrical shock and/or damage to equipment:
- Keep equipment away from water or liquid sources;
- Keep equipment away from high heat or high humidity;
- Keep equipment properly ventilated (do not block or cover ventilation openings);
- Make sure to use recommended voltage and power source settings;
- Always install and operate equipment near an easily accessible electrical socket outlet;
- Secure the power cord (do not place any object on/over the power cord);
- Only install/attach and operate equipment on stable surfaces and/or recommended mountings;
- If the equipment will not be used for long periods of time, turn off the power source and unplug the equipment.

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Conventions

The following conventions may be used throughout this manual, denoting special levels of information



Note: This information adds clarity or specifics to text and illustrations.



Caution: This information indicates the possibility of minor physical injury, component damage, data loss, and/or program corruption.



Warning: This information warns of possible serious physical injury, component damage, data loss, and/or program corruption.

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Revision History

Revision	PLM Revision	Description	Date	Author
0.8		1st release to TPDC	2022-11-24	Alex Wang

Table of Contents

1. OCP Card Introduction 6
1.1 Mechanical and Environmental 7
2. Block Diagram ..... 錯誤! 尚未定義書籤。
3. Mezzaniee card pin Descriptions 13
3.1 Pin Summary 13
4. Mechanical 16

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List of Figures

Figure 1 – 12
Figure 2 – 錯誤! 尚未定義書籤。
Figure 3 – 9
Figure 4 – 錯誤! 尚未定義書籤。
Figure 5 – 錯誤! 尚未定義書籤。
Figure 6 – 錯誤! 尚未定義書籤。
Figure 7 – 錯誤! 尚未定義書籤。

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1. OCP Mezzanine Card Introduction

Warning: This is an EA (early available) engineering manual. The contents may not accurately reflect the actual or final version of this product.

The original OCP Mezzanine Card for Intel v2.0 Motherboard specification1 have been developed mainly to serve the use case of Single and Dual port 10G Ethernet card. Adoption of this specification has been seen in OCP community on different server and storage platforms. Over the recent two years, demand of supporting new use cases were raised and the original Mezzanine card specification cannot support those new use cases without modification in order to support different I/O types, increase bandwidth of data and management, and support higher power controller IC. Mezzanine card 2.0 specification is developed based on original OCP Mezzanine card. It extends the card mechanical and electrical interface to enable new uses cases for Facebook and other users in OCP community. The extension takes backward compatibility to existing OCP platforms designed for original OCP Mezzanine card specification V0.5 into consideration, and some tradeoffs are made between backward compatibility and new requirements.

Mezzanine card with different placement height restriction, I/O connectors' location, and mezzanine connector stacking height to baseboard.
Type 1 is the original OCP Mezzanine 1.0 stack with 8mm stacking. This is also the most widely adopted stacking Type. The baseboard needs to have a cut out with in the I/O area since most network connector is taller than 8mm. Type 2 is based on Type 1, but change stacking to 12mm for taller heatsink. Baseboard and system does not have strict height constrain can take this stacking with the benefit to avoid have cut out in baseboard, and having taller heatsink on Mezzanine card side.

64 pin Connector C is added in Mezzanine card 2.0 Rev0.45. The pin assignment of Connector C has up to 4x KR, their low speed and I2C signals, and power pins. It is created to support the use case of KR only. Connector C can be used independently on Mezzanine card side. The typical KR Mezzanine card implementation with Connector C does not have Connector A and Connector B on card side.

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OCP card **Ethernet KR/KX Interfaces**

4x SFI Mezzanine card with Connector C and with 4 pcs SFP+ connectors.

Module's Broadcom® Ethernet Controller BCM57502, connected to the SoC through PCIex8 lane

4x 10GBASE-KR and its sideband signals

Supports both full-duplex and half-duplex

Note: BCM57504 4x 25GBASE-KR only make sense if PHYs are on carrier board directly, not with OCP card, because OCP connectors cannot sustain 25G

1.1 Mechanical and Environmental

Form Factor and Specification

Mezzanine Card Vertical Stack Types Dimension

TYPE	A(typ)	B(max)	C(max)	H(max)	S(typ)	I/O	Controller IC
TYPE 3	1.57mm	7.5mm	4.5mm /4mm	7.5mm	8mm	Primary side optional /Secondary side	Primary side/ secondary side

64 pin Connector C is added in Mezzanine card 2.0 Rev0.45. The pin assignment of Connector C has up to 4x KR, their low speed and I2C signals, and power pins. It is created to support the use case of KR only. Connector C can be used independently on Mezzanine card side. The typical KR Mezzanine card implementation with Connector C does not have Connector A and Connector B on card side.

	Mezzanine card (5mm stack)	Mezzanine card (8/12mm stack)	Baseboard (5/8mm stack)	Baseboard (12mm stack)
Connector C	FCI/10135584-641402LF	FCI/10135584-644402LF	FCI/10135583-641402LF	FCI/10135583-642402LF

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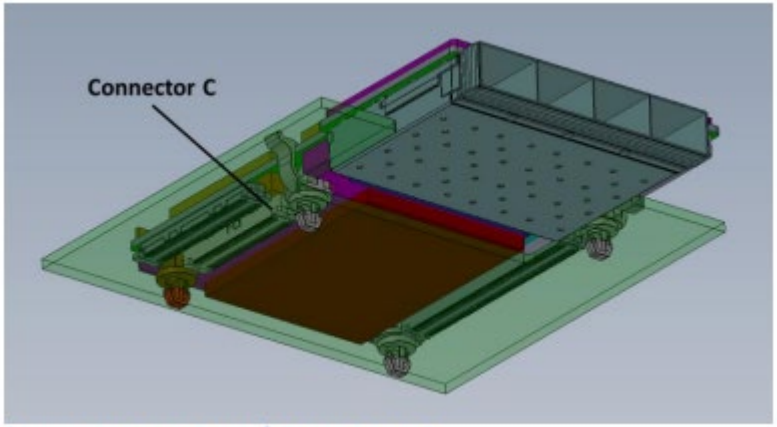


Figure 3: Location of Connector C

Operating Temperature

Standard	0°C to +60°C at 12V	Storage: -20°C to +80°C

The module can operate at -40°C to +85°C at 12V if Broacom LAN controller is not populated

Humidity

5-90% RH operating, non-condensing, 5-95% RH storage (and operating with conformal coating)

Shock and Vibration

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IEC 60068-2-64 and IEC-60068-2-27
MIL-STD-202F, Method 213B, Table 213-I, Condition A and Method 214A, Table 214-I, Condition D

HALT tested

Thermal Stress, Vibration Stress, Thermal Shock and Combined Test

EMI

EN55032 Class B inside an enclosure

Ultrasound equipment will typically be sensitive to noise in the 1MHz to 20MHz band, we shall handle it well during these bands

De-rating

De-rating file is provided by RD (delta temperature of some of components is based on the experience of previous products) and reviewed/approved by RRC team before each Gerber Out

Once we have real sample on-hand, the temperature of critical components shall be measured and feedback to the De-rating file to see if it still in specification.

MTBF

200,000 hrs commercial 40℃ ambient (according MIL calculation) based on actual calculated de-rating

120,000 hrs ETT -20℃~70℃ ambient (according MIL calculation) based on actual calculated de-rating (excludes the BCM57504 LAN controller)

Specific Requirement

- PM need a table with early predicted MTBF (must with CPU/PCH into consideration) at 0℃ to +60℃ and -40℃to +85℃ for every SKUs on leading platform. We need this table to align which SKUs are suitable for ETT support

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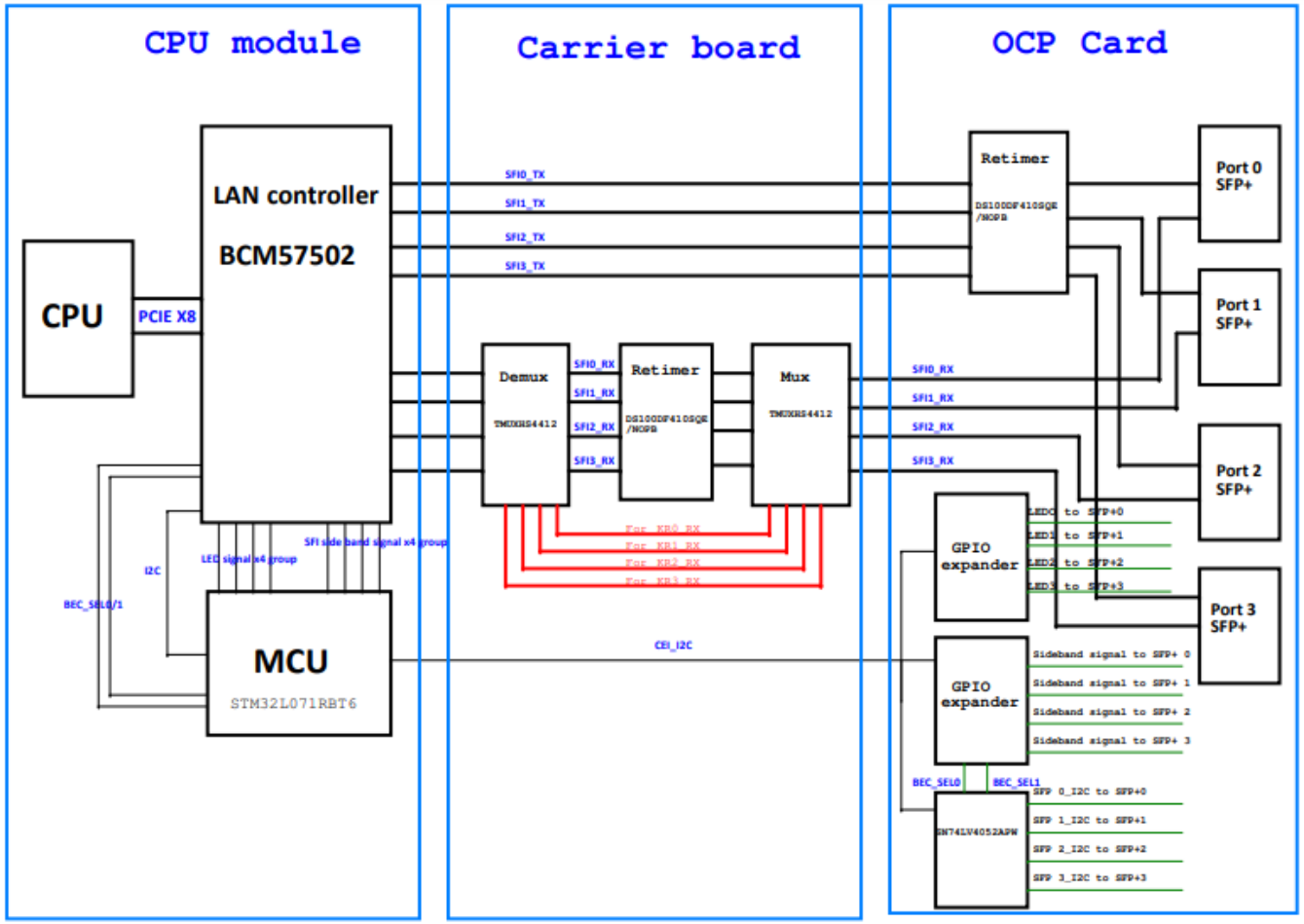
- All the final version MTBF shall be calculated with real CPU/PCH data (for example, Intel has real reliability data, called F.I.T data)
- All the standard SKUs need has its own final version MTBF report, not just the highest-end SKU

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2. Block Diagram



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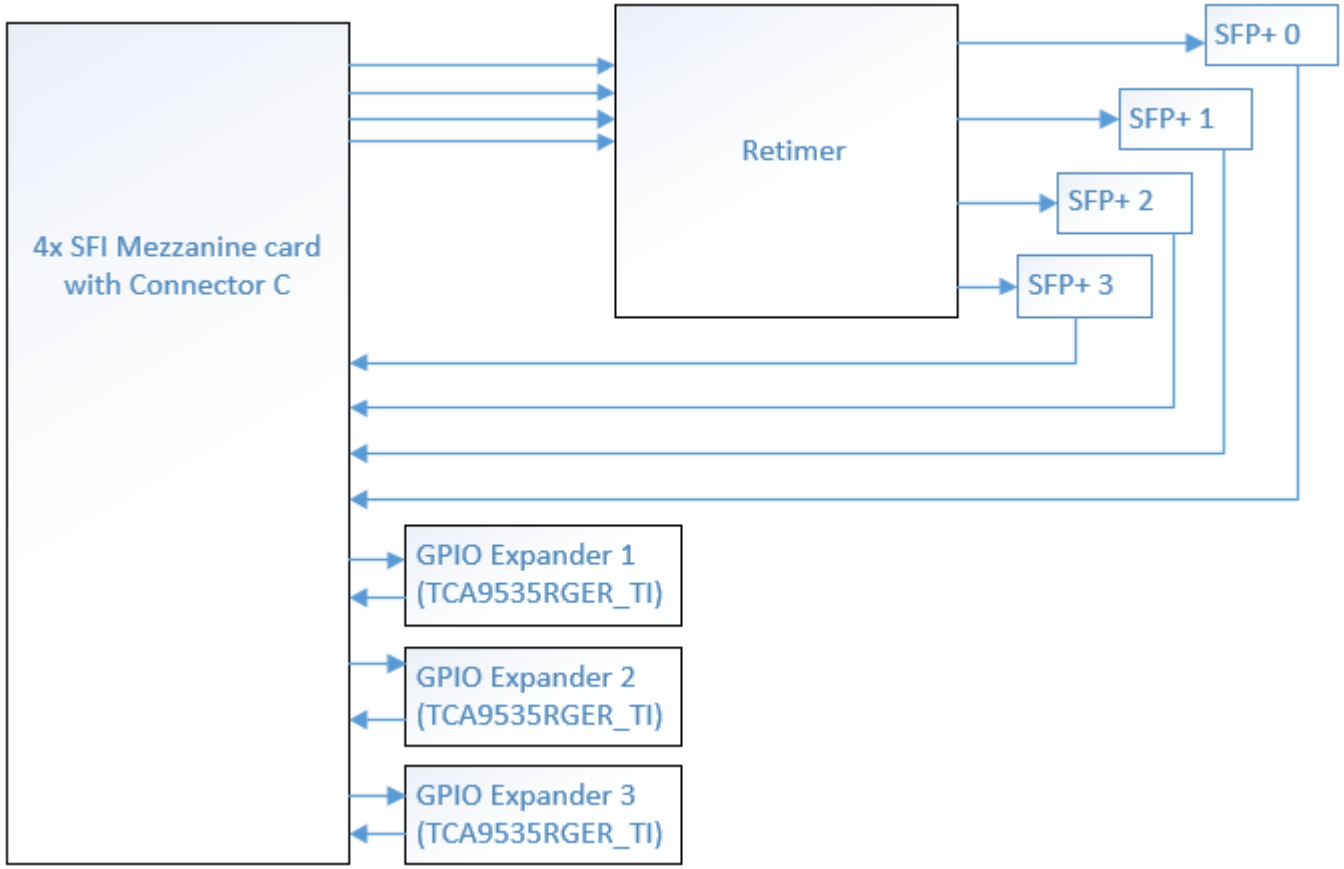


Figure 1 –Function Block Diagram

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3. Mezzanine card pin Descriptions

3.1 Pin Summary (DRAFT)

Mezzanine card pin description is shown in below table; input output direction is in the prospective of baseboard.

Signals on Connector C	Type	Description
GND	Ground	Ground return
P12V/P12V_AUX/P5V_AUX	Power	Power supply to Mezzanine connector
SDP[3..0]	Input	Software defined pin for port 0~3; OD, pull up at baseboard side SFP+ KR Mezz: MODULE_PRSENT_N[3..0] for Port [3..0] SFP+ modules 10GBaseT KR Mezz: INT_N [3..0] for Port [3..0] 10GBaseT PHY QSFP+ KR Mezz: SDP_0 to QSFP+ MODULE_PRSENT_N
KR_TX_DP/N<3..0>	Output	KR TX; total up to 4 lanes on Connector C
KR_RX_DP/N<3..0>	Input	KR RX; total up to 4 lanes on Connector C
LED_P[3..0]_0_N	Output	Port[3..0] LED0 for link speed; OD and active low

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LED_P[3..0]_1_N	Output	Port[3..0] LED1 for link activity; OD and active low
SHARED_KR_MDC	Output	MDC for PHY
SHARED_KR_MDIO	Bidirectional	MDIO for PHY
MEZZ_SMCLK	Output	SMBus Clock for Mezzanine slot for PHY/Repeater config/Mezz FRU EEPROM; 3.3V AUX rail; Share with thermal reporting interface; Both 100Kb/s and 400Kb/s shall be supported
MEZZ_SMDATA	Bidirectional	SMBus Data for Mezzanine slot for PHY/Repeater config/Mezz FRU EEPROM; 3.3V AUX rail; Share with thermal reporting interface; Both 100Kb/s and 400Kb/s shall be supported
EXT_MDIO_I2C_SEL	Output	Strapping pin to configure PHY/repeater on KR Mezzanine card to be accessed through MDIO or I2C. High for MDIO and Low for I2C
Module_SCL[3..0]	Output	Dedicate I2C for SFP+ or QSFP+ modules
Module_SDA[3..0]	Bidirectional	Dedicate I2C for SFP+ or QSFP+ modules
MEZZ_PRSNTC2_N	Input	Connector C Present Pin; connect to GND with 0 ohm on Mezzanine card side
RSVD	TBD	Reserved for Future use

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Power Pins on Connector C

Power Rail	Voltage Tolerance	# of pins	Current Capability	Status
P12V_AUX/P5V_AUX-P12V	±8%(max)	3	2.4A	Auxiliary Power/Normal Power

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Connector C			
Signal	Pin	Pin	Signal
P12V_AUX/P5V_AUX-P12V	C33	C1	MEZZ_SMCLK
P12V_AUX/P5V_AUX-P12V	C34	C2	MEZZ_SMDATA
P12V_AUX/P5V_AUX-P12V	C35	C3	EXT_MDIO_I2C_SEL
RSVD	C36	C4	GND
SDP0	C37	C5	KR_TX_DP<2>
SDP1	C38	C6	KR_TX_DN<2>
GND	C39	C7	GND
KR_TX_DP<0>	C40	C8	LED_P1_0_N
KR_TX_DN<0>	C41	C9	LED_P1_1_N
GND	C42	C10	GND
LED_P0_0_N	C43	C11	KR_TX_DP<3>
LED_P0_1_N	C44	C12	KR_TX_DN<3>
GND	C45	C13	GND
KR_TX_DP<1>	C46	C14	LED_P2_0_N
KR_TX_DN<1>	C47	C15	LED_P2_1_N
GND	C48	C16	GND
SHARED_KR_MDC_0	C49	C17	KR_RX_DP<2>
SHARED_KR_MDIO_0	C50	C18	KR_RX_DN<2>
GND	C51	C19	GND
KR_RX_DP<0>	C52	C20	Module_SCL0
KR_RX_DN<0>	C53	C21	Module_SDA0
GND	C54	C22	GND
LED_P3_0_N	C55	C23	KR_RX_DP<3>
LED_P3_1_N	C56	C24	KR_RX_DN<3>
GND	C57	C25	GND
KR_RX_DP<1>	C58	C26	Module_SCL1
KR_RX_DN<1>	C59	C27	Module_SDA1
GND	C60	C28	GND
Module_SCL2	C61	C29	Module_SCL3
Module_SDA2	C62	C30	Module_SDA3
GND	C63	C31	SDP2
MEZZ_PRSNTC2_N	C64	C32	SDP3

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Notes:

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4. Mechanical

OCP Card views

Quad Port 10GBaseT RJ45 KR Mezzanine card with Connector C (Type 2)

heat sink height is limited to 7.5mm max and may not be able to provide sufficient cooling to some controller IC. Type 2 vertical stack allows 11.5mm max for heatsink and provide more freedom to thermal design. This implementation has limitation in system mechanical compatibility due to taking extra volume. Vendor may need to modify mechanical design in order to support it.

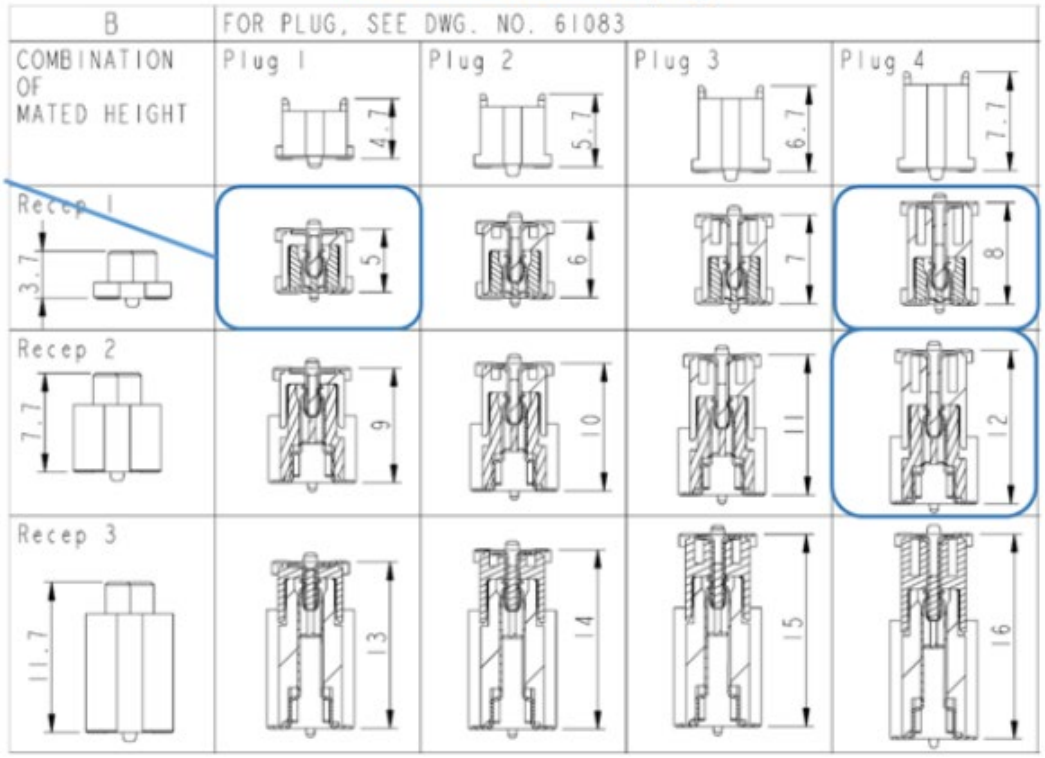
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Mezzanine card side plug

Vertical stack
Type 4



Baseboard side Receptacle

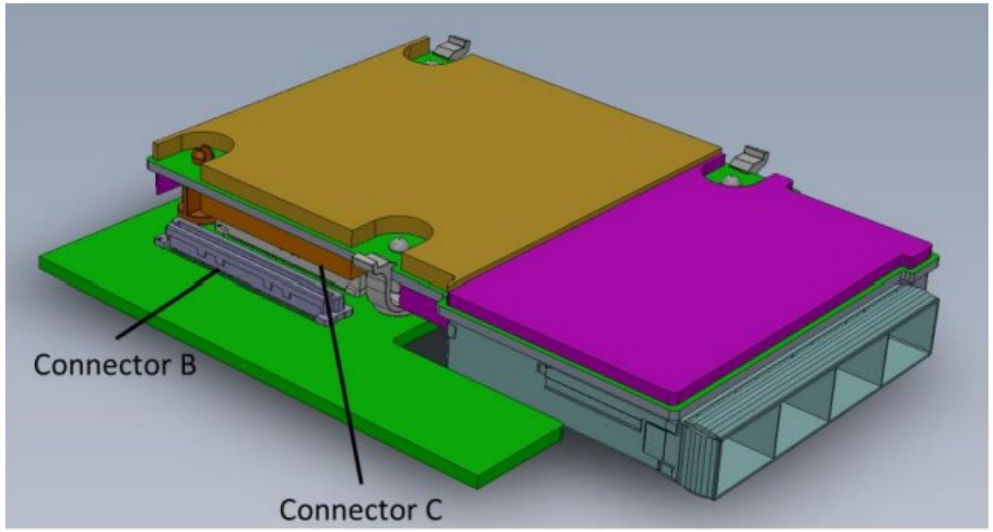
Vertical stack
Type 1/3

Vertical stack
Type 2/5

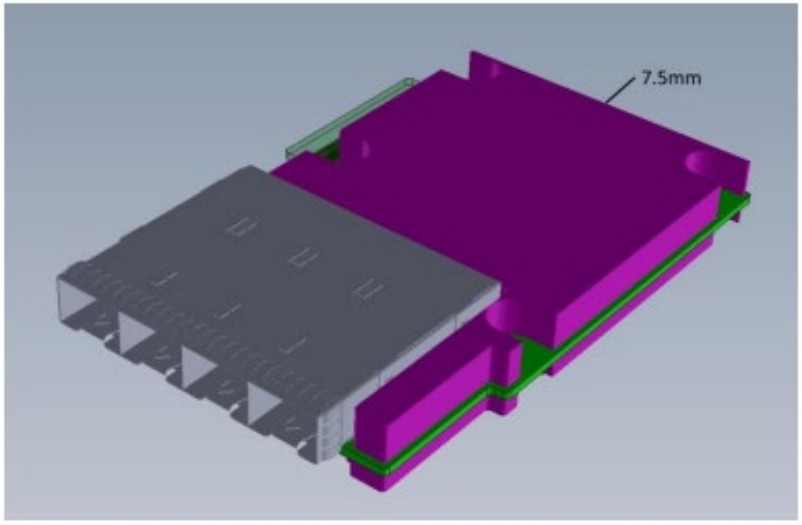
Mezzanine Connector Selection Matrix

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Side View of Quad port 10G SFP+ KR Mezzanine Card



Secondary Side View of Quad Port SFP+ Mezzanine Card

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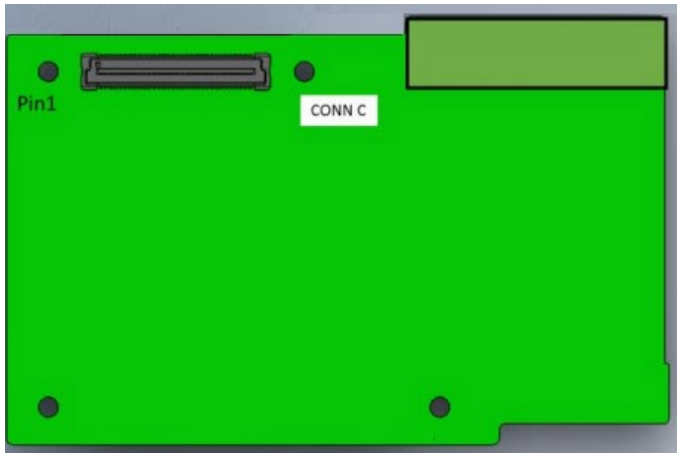


Figure 2 – Card with connector C bottom view

Mezzanine Card Vertical Stack Types Dimension

TYPE	A(typ)	B(max)	C(max)	H(max)	S(typ)	I/O	Controller IC
TYPE 2	1.57mm	2.9mm /2.0mm	4.5mm /4mm	11.5mm	12mm	Primary side /Secondary side optional	Primary side

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Product Specification

OCP-4x10G-SFP+

Rev 1.0

Date: 2022/11/24

Status: Released

Author:Alex.Wang

Approved: OCP-4x10G-SFP+ TPDC member

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