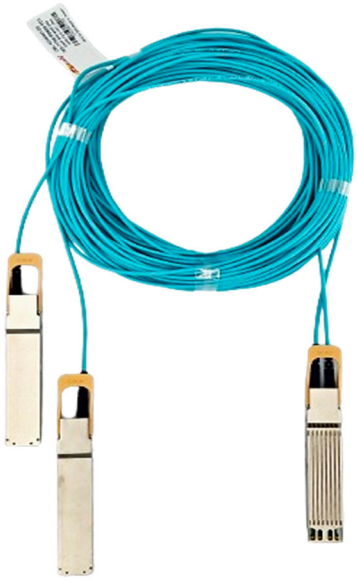
Specification

Immersion Active Optical Cable

800G OSFP (Air, Heat Sink Open Top) to

2x 400G OSFP RHS (Immersion) Breakout Cable



TES-718H8-P8M##

Length: 2M…50M

Ordering Information:

Model Name	TES-718H8-P8M##	Note
Voltage	3.3V	
Device type	850 VCSEL	
Temperature	0°C~+70°C	
Cable sheath	PUR	
Distance	2~ 50m	
Latch Color	Beige	

Features

- Compliant with OSFP MSA HW Rev4.1 Type 2 Housing
- Compliant with IEEE P802.3cu-2021 400GBASE-SR4 Optical Interface
- 800G end compliant with IEEE P802.3ck D3.0: 8x100GAUI-1 C2M Electrical Interface and is not immersion type
- Each 400G ends compliant with IEEE 802.3bs: 4x100GAUI electrical interface and is immersion type
- 400G OSFP end and cable are compatible with immersion cooling liquid
- Cable sheath made with PUR material
- Operation case temperature 0°C to +70°C
- Class 1 Laser Safety
- Compliant with CMIS Rev5.0
- I2C management interface
- RoHS-6 compliant
- 400G OSFP end cable are compatible with immersion cooling liquid - Shell's S3X Fluid
- 400G OSFP end is Flat Top: OSFP RHS (Riding Heat Sink)
- 800G OSFP end is Finned Top: 2xSR4 OSFP Type 2, Heat Sink, Open Top
- Working Firmware for Nvidia HCA (PN: MCX75310AAS-NEAT)
- Working Firmware for QM9790 NDR Switch (PN: NVIDIA MQM9790-NS2R)

Applications

- 800G Ethernet of OSFP 800G end
- 400G Ethernet of OSFP 400G end
- Infiniband of OSFP 800G end(8 lanes)
- Infiniband of OSFP 400G end(4 lanes)
- Data Center and Enterprise Networking

Absolute Maximum Ratings

Parameter	Symbol	Min	Typ.	Max	Unit	Note
Maximum Supply Voltage	Vcc	0		3.6	V	
Storage Temperature	Ts	-40		85	℃	
Relative Humidity (no-condensation)	RH	0		85	%	
Damage Threshold	THd	5			dBm	
Control Input Voltage		-0.3		Vcc+0.5	V	
Operating Case Temperature		0		70	℃	

Note:

1. Absolute maximum ratings are those beyond which damage to the device may occur.
2. Prolonged operation between the operational specifications and absolute maximum ratings is not intended and may cause permanent device degradation.

Recommended Operating Conditions

Parameter		Symbol	Min	Typ.	Max	Unit	Note
Supply Voltage		Vcc	3.135	3.3	3.465	V	
Supply Current	800G	Icc			4.5	A	
	400G				3.3		
Power Consumption	800G	PD		13.5	15	W	
	400G			9	10	W	
Case Temperature		Top	0		70	℃	
Data Rate, each lane				53.125		GBd	
Data Rate Accuracy			-100		100	ppm	
Length Option (OM3/OM4)		D	2		30/50	m	

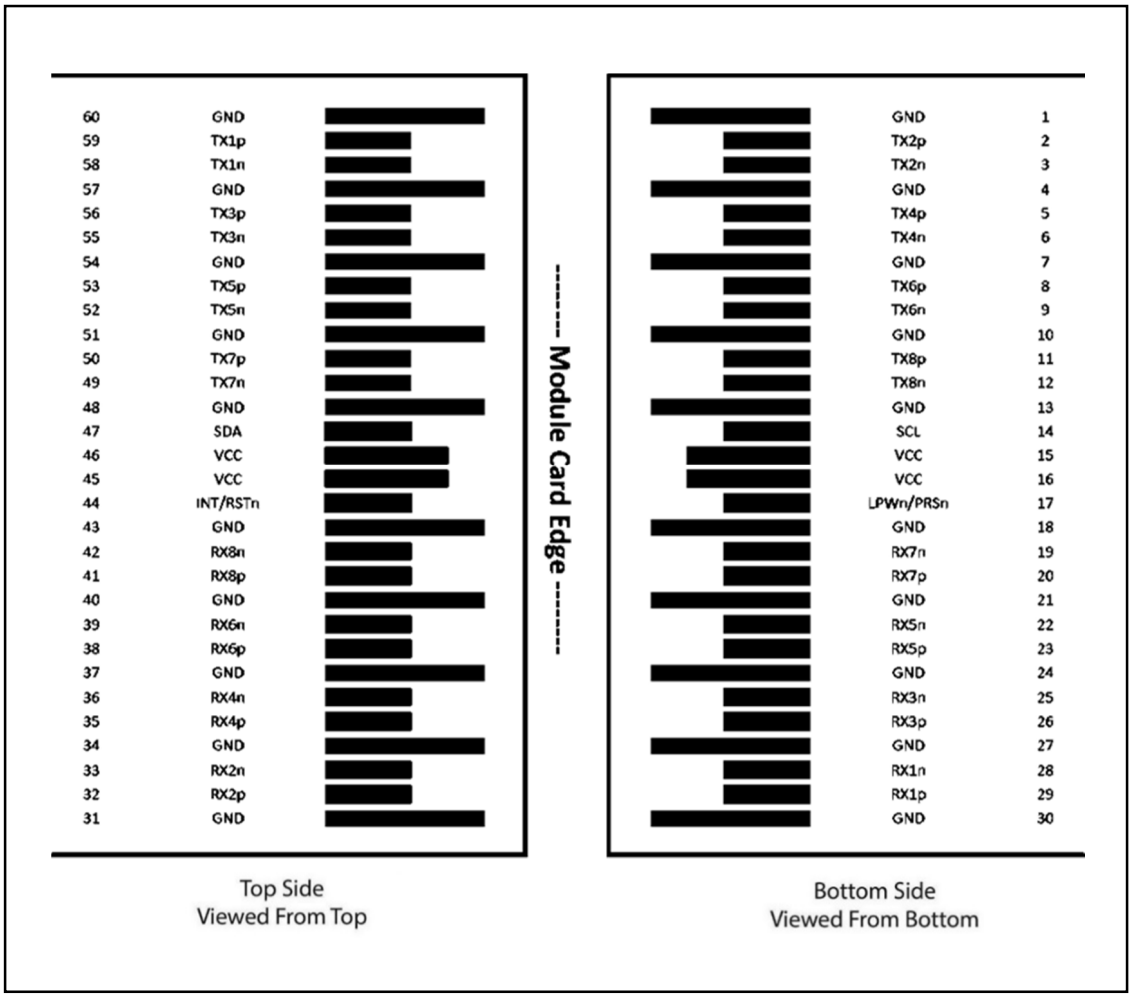
800G OSFP End Electrical Characteristics

Parameter	Test point	Symbol	Min	Typ.	Max	Unit
Transmitter						
Signaling Rate, each lane	TP1		53.125 ± 100 ppm			GBd
Differential Input Voltage Tolerance	TP1a		750			mV
Effective Return Loss	TP1	ERL	8.5			dB
Single-ended Input Voltage	TP1a		-0.4		3.3	V
DC Common-mode Input Voltage	TP1		-0.35		2.85	V
Differential Termination Mismatch					10	%
AC Common-mode Voltage Tolerance Low-frequency, VCMLF Full-band, VCMLF	TP1a		 32 80			mV
Differential to Common-mode Return loss, RLcd	TP1		IEEE 802.3ck D3.3 Equation 120G-2			dB
Receiver						
Signaling Rate, each lane	TP4		53.125 ± 100 ppm			GBd
Peak-to-Peak AC Common Mode Voltage Low-frequency, VCMLF Full-band, VCMLF	TP4				 32 80	mV
Differential Peak-to-Peak Output Voltage Short Mode Long Mode	TP4				 600 845	mV
Eye Height	TP4	EH	15			mV
Vertical Eye Closure	TP4	VEC			12	dB
Effective Return Loss	TP4	ERL	8.5			dB
DC Common-mode Voltage Tolerance	TP4		-0.35		2.85	V
Transition Time	TP4		8.5			ps
Differential Termination Mismatch	TP4				10	%
Common-mode to differential return loss, RLdc	TP4		IEEE 802.3ck Equation 120G-1			dB

400G OSFP End Electrical Characteristics

Parameter	Symbol	Min	Typ.	Max	Unit
Transmitter					
Differential Input Voltage Tolerance (TP1a)		750			mV
Single-ended Voltage Tolerance Range		-0.4		3.3	V
DC Common-mode Voltage Tolerance		-0.35		2.85	V
Differential Termination Mismatch				10	%
Receiver					
AC Common-mode output Voltage (RMS)				25	mV
Differential Output Voltage Short Mode / Long Mode				600 / 845	mV
Near-end Eye height, differential		70			mV
Far-end Eye height, differential		30			mV
Far-end pre-cursor ratio		-4.5		2.5	%
DC Common-mode Voltage Tolerance		-0.35		2.85	V
Transition Time (min, 20% to 80%)		9.5			ps
Differential Termination Mismatch				10	%

Module Pad Assignments and Descriptions



Pin	Logic	Symbol	Description	Plug Sequence	Notes
1	GND	*GND*	Ground	1	
2	CML-I	*Tx2p*	Transmitter Non-Inverted Data Input	3	
3	CML-I	*Tx2n*	Transmitter Inverted Data Input	3	
4	GND	*GND*	Ground	1	
5	CML-I	*Tx4p*	Transmitter Non-Inverted Data Input	3	
6	CML-I	*Tx4n*	Transmitter Inverted Data Input	3	
7	GND	*GND*	Ground	1	
8	CML-I	*Tx6p*	Transmitter Non-Inverted Data Input	3	N/A for 400G end
9	CML-I	*Tx6n*	Transmitter Inverted Data Input	3	N/A for 400G end

10	GND	*GND*	Ground	1	
11	CML-I	*Tx8p*	Transmitter Non-Inverted Data Input	3	N/A for 400G end
12	CML-I	*Tx8n*	Transmitter Inverted Data Input	3	N/A for 400G end
13	GND	*GND*	Ground	1	
14	LVCOMS	*SCL*	2-wire Serial Interface Clock	3	
15	VCC	*VCC1*	+3.3V Power Supply	2	
16	VCC	*VCC1*	+3.3V Power Supply	2	
17	Muti-Level	*LPWn/PRSn*	Low-Power Mode / Module Present	3	
18	GND	*GND*	Ground	1	
19	CML-O	*Rx7n*	Receiver Inverted Data Output	3	N/A for 400G end
20	CML-O	*Rx7p*	Receiver Non-Inverted Data Output	3	N/A for 400G end
21	GND	*GND*	Ground	1	
22	CML-O	*Rx5n*	Receiver Inverted Data Output	3	N/A for 400G end
23	CML-O	*Rx5p*	Receiver Non-Inverted Data Output	3	N/A for 400G end
24	GND	*GND*	Ground	1	
25	CML-O	*Rx3n*	Receiver Inverted Data Output	3	
26	CML-O	*Rx3p*	Receiver Non-Inverted Data Output	3	
27	GND	*GND*	Ground	1	
28	CML-O	*Rx1n*	Receiver Inverted Data Output	3	
29	CML-O	*Rx1p*	Receiver Non-Inverted Data Output	3	
30	GND	*GND*	Ground	1	
31	GND	*GND*	Ground	1	
32	CML-O	*Rx2p*	Receiver Non-Inverted Data Output	3	
33	CML-O	*Rx2n*	Receiver Inverted Data Output	3	
34	GND	*GND*	Ground	1	
35	CML-O	*Rx4p*	Receiver Non-Inverted Data Output	3	
36	CML-O	*Rx4n*	Receiver Inverted Data Output	3	
37	GND	*GND*	Ground	1	
38	CML-O	*Rx6p*	Receiver Non-Inverted Data Output	3	N/A for 400G end
39	CML-O	*Rx6n*	Receiver Inverted Data Output	3	N/A for 400G end
40	GND	*GND*	Ground	1	
41	CML-O	*Rx8p*	Receiver Non-Inverted Data Output	3	N/A for 400G end
42	CML-O	*Rx8n*	Receiver Inverted Data Output	3	N/A for 400G end
43	GND	*GND*	Ground	1	
44	Muti-Level	*INT/RSTn*	Module Interrupt / Module Reset	3	
45	VCC	*VCC1*	+3.3V Power Supply	2	
46	VCC	*VCC1*	+3.3V Power Supply	2	
47	LVCMOS	*SDA*	2-wire Serial Interface Data	3	

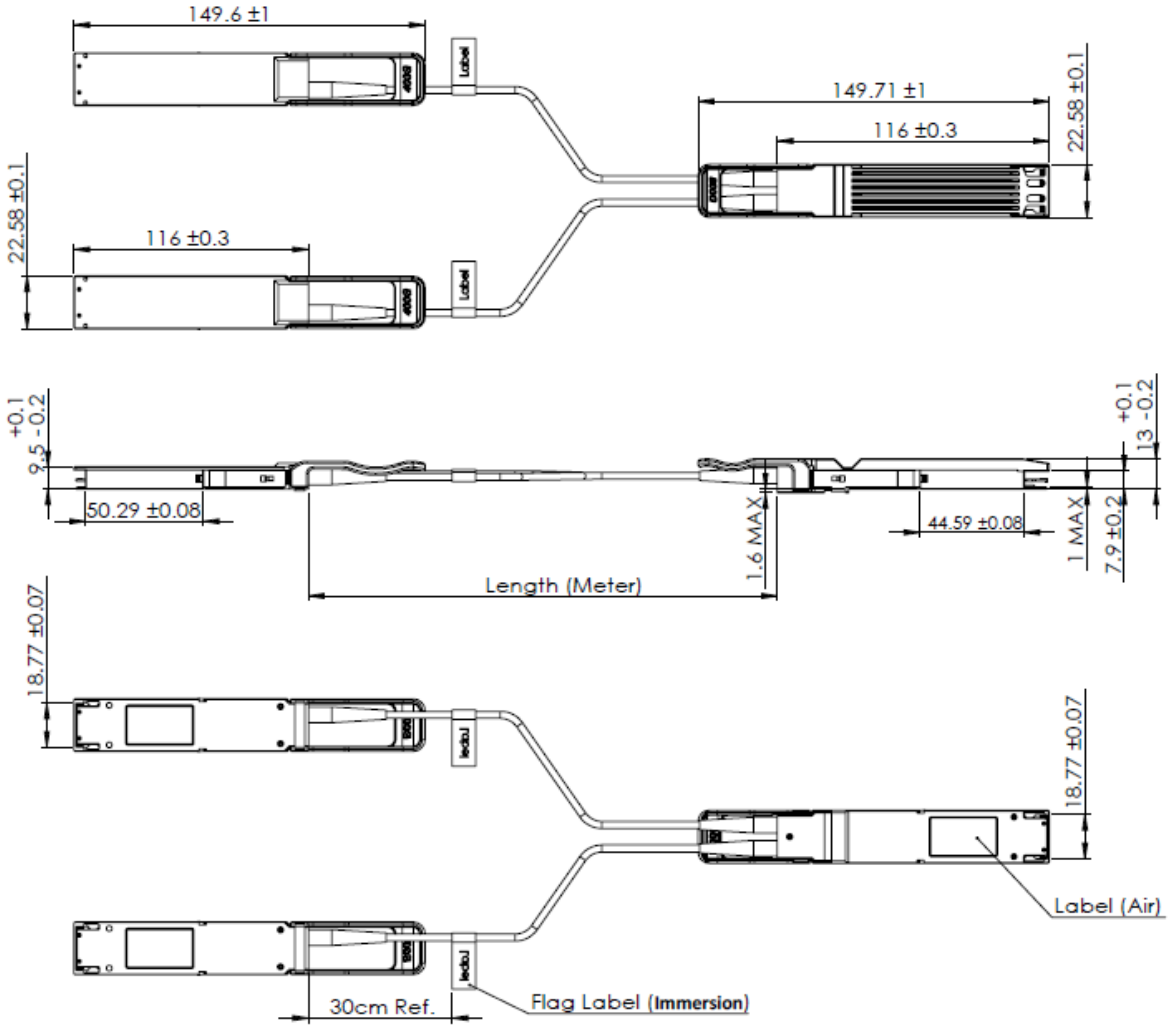
48	GND	*GND*	Ground	1	
49	CML-I	*Tx7n*	Transmitter Inverted Data Input	3	N/A for 400G end
50	CML-I	*Tx7p*	Transmitter Non-Inverted Data Input	3	N/A for 400G end
51	GND	*GND*	Ground	1	
52	CML-I	*Tx5n*	Transmitter Inverted Data Input	3	N/A for 400G end
53	CML-I	*Tx5p*	Transmitter Non-Inverted Data Input	3	N/A for 400G end
54	GND	*GND*	Ground	1	
55	CML-I	*Tx3n*	Transmitter Inverted Data Input	3	
56	CML-I	*Tx3p*	Transmitter Non-Inverted Data Input	3	
57	GND	*GND*	Ground	1	
58	CML-I	*Tx1n*	Transmitter Inverted Data Input	3	
59	CML-I	*Tx1p*	Transmitter Non-Inverted Data Input	3	
60	GND	*GND*	Ground	1	

Mechanical Design Diagram

Unit: mm

2x400G OSFP SR4 Flat Top/Riding Heat Sink (Immersion)
800G OSFP 2xSR4 Finned Top/Heat Sink, Open Top, Type 2 (Air)
PUR based cable jacket

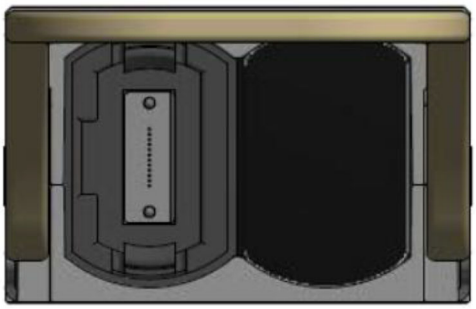
[2x400G OSFP SR4 Flat Top (Immersion)] [800G OSFP 2xSR4 Finned Top/Type 2 (Air)]

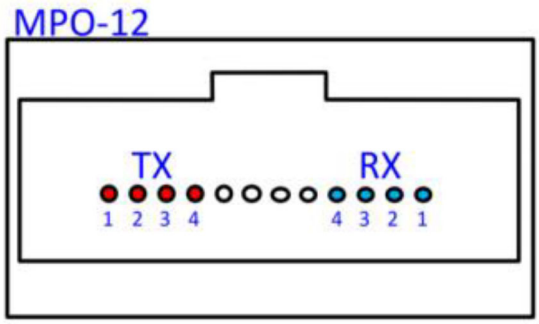


https://osfpmsa.org/assets/pdf/OSFP_Module_Specification_Rev5_0.pdf

400G Optical Port Description

The optical interface port is MPO-12 receptacle.
The transmit and receive optical lanes shall occupy the positions depicted in Figure when looking into the MDI receptacle with the connector keyway feature on top.

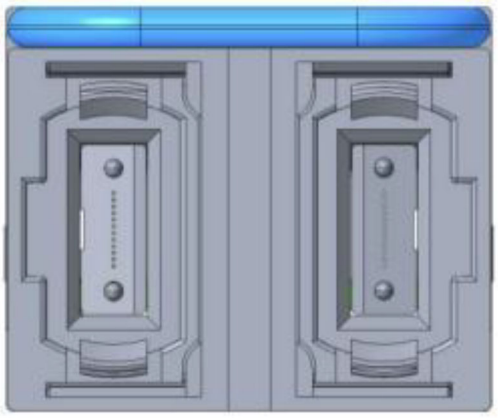




Optical Media Dependent Interface port assignments

800G Optical Port Description

The optical interface port is dual MPO-12 APC receptacle.
The transmit and receive optical lanes shall occupy the positions depicted in Figure when looking into the MDI receptacle with the connector keyway feature on top.



OSFP Finned Top/Heat Sink, Open Top, Type 2

3 OSFP Module Mechanical Specification

For OSFP1600 (OSFP module which support 200G per lane), see section 4. For OSFP or OSFP800, which support 50G or 100G per lane, either of the mechanical specification in this section or section 4 to be applied.

3.1 Overview

A typical OSFP module is shown in Figure 3-1. An assortment of connector types are shown. Connector and cable variations not shown here are allowed, including as depicted in Section 12.4.

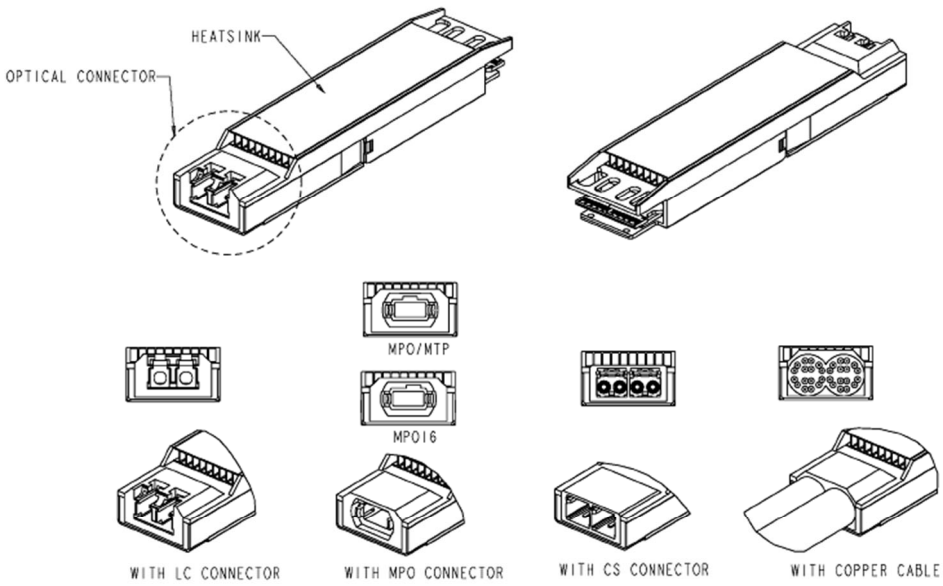


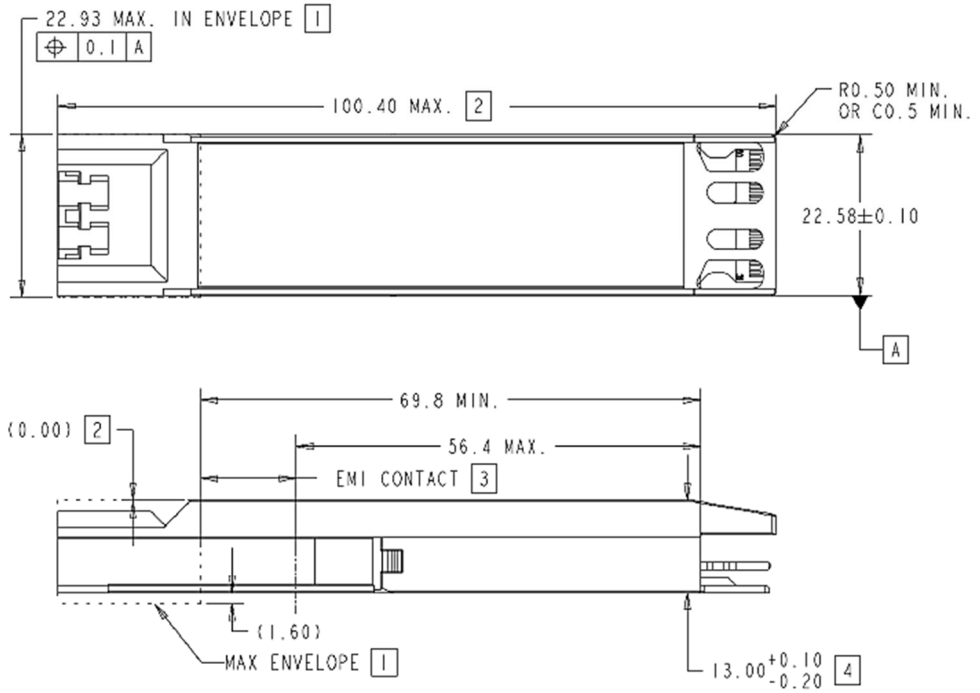
Figure 3-1: OSFP module with different connectors (Duplex LC, MPO, CS®, Copper)

In the module mechanical drawings included throughout this specification, the datum as defined in Table 3-1 shall apply.

Table 3-1: Descriptions of the module mechanical datum

Designator	Description	Figure
A	Width of Module	Figure 3-2
B	Forward stop of Module	Figure 3-2; also see Figure 3-8
C	Bottom surface of Module	Figure 3-2
D	Width of Module pc board	Figure 3-19
E	Signal pad leading edge of Module pc board	Figure 3-19
F	Top surface of Module pc board	Figure 3-19

Figure 3-2 shows the dimensions of the Standard OSFP module. Note that the module is shown with a typical latch release mechanism without a pull tab. Alternate latch release mechanisms are allowed. All dimensions in this specification are in millimeters (mm) unless otherwise noted.



NOTES:

1 FRONT OF THE MODULE, PULL TAB AND OTHER COMPONENTS CAN EXTEND 1.6MM MAX FROM THE BOTTOM OF THE MODULE AND CAN HAVE UP TO 22.93mm WIDTH IN THE MAX ENVELOPE SHOWN.

2 APPLIES TO TYPE 1 MODULE ONLY.

3 INDICATED SURFACES (ALL 4 SIDES) TO BE CONDUCTIVE FOR CONNECTION TO CHASSIS GROUND.

4 APPLIES FROM THE TOP OF THE MODULE TO THE BOTTOM OF THE MODULE, INSIDE THE CAGE.

Figure 3-2: OSFP overall dimensions

Figure 3-3 shows the total length and front height of Type 1, Type 2 and Type 3 OSFP modules. A Type 2 OSFP module provides maximum of 16mm additional length in front than a Type 1 module, and a Type 3 OSFP module provides maximum of 3.6mm additional height in the front than a Type 2 module. Type 2 and Type 3 module can provide additional space for various optical interface, as described in the section 12.4.
Type 3 OSFP module is not compatible with stacked cage in the section 6 and 7.

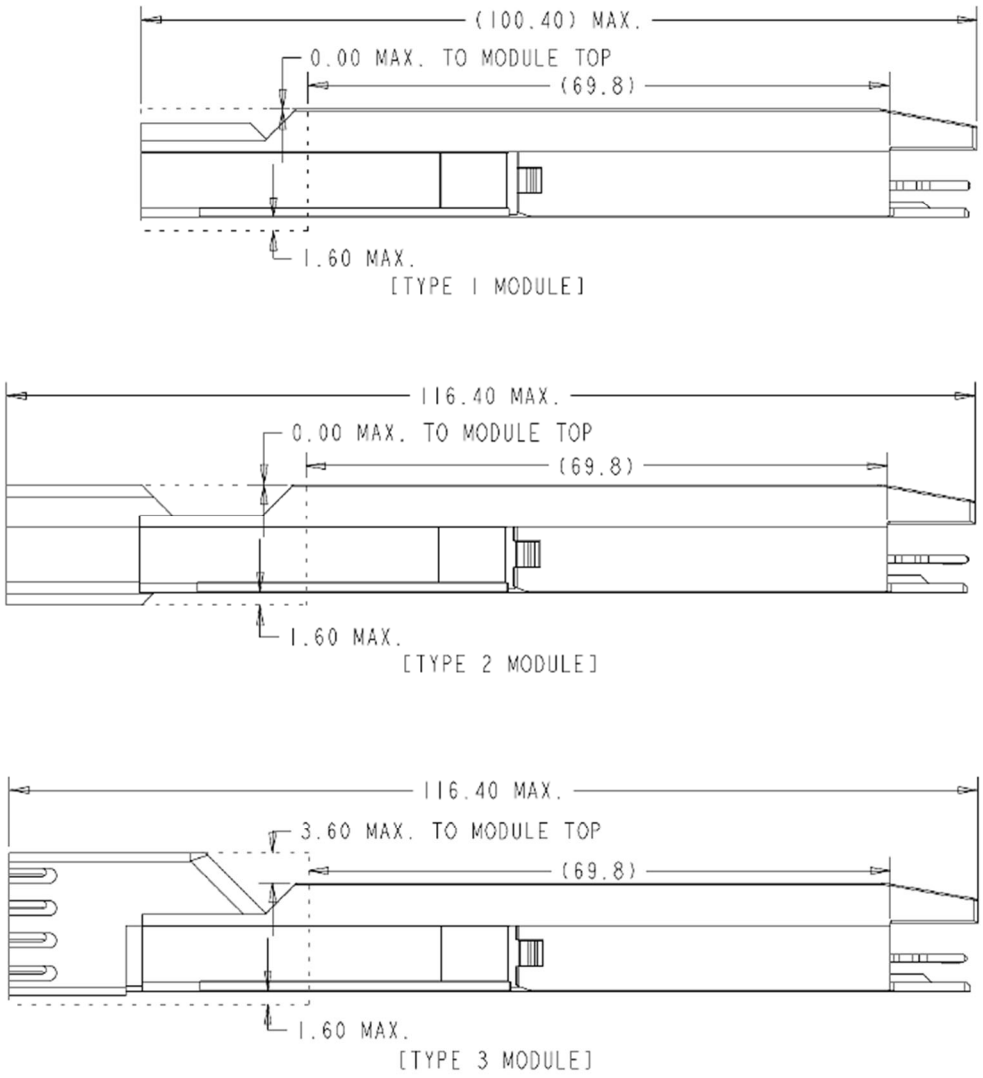


Figure 3-3: Size of module front, for Type 1, Type 2 and Type 3 OSFP

3.4 Heat Sink, Open Top

Modules which have a non-closed top, i.e. open top, are allowed only when the heat sink fins are designed to meet the dimensional requirements outlined in Figure 3-16 through Figure 3-18 in order to prevent EMI finger damage and to ensure proper EMI shielding. Height and length of the heat sink may differ from reference height presented, but still shall allow an amount of airflow as defined in Section 10.2.

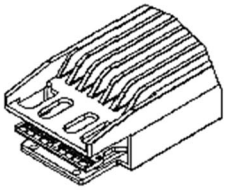


Figure 3-16: Open top heat sink (Isometric view)

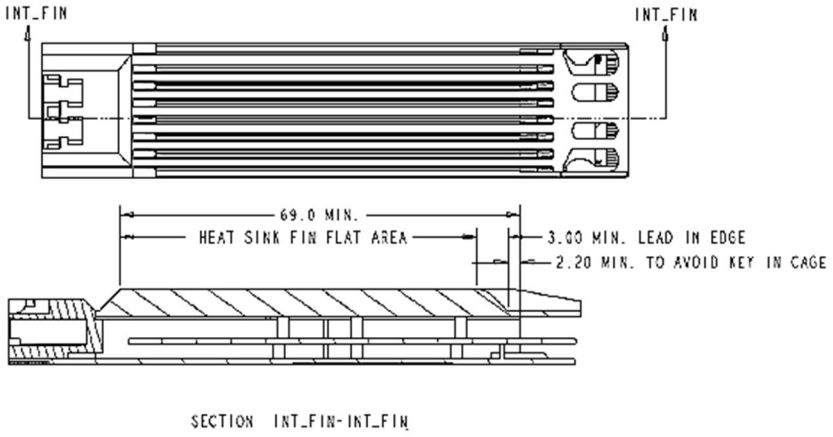


Figure 3-17: Heat sink location

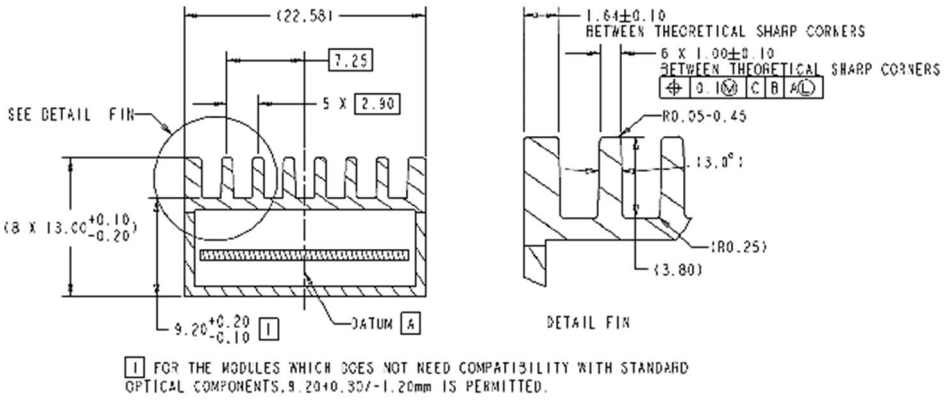


Figure 3-18: Heat sink fin pitch

OSFP Flat Top/Riding Heat Sink (RHS)

11 OSFP Riding Heat Sink Module and Cage Mechanical Specification

11.1 Overview

OSFP Riding Heat Sink (OSFP-RHS) is a 9.5mm high pluggable module which does not have an integrated heat sink as shown in the Figure 11-1 and Figure 11-2. In place of OSFP's integrated heat sink, OSFP-RHS cage shall have a riding heat sink. To prevent insertion of OSFP-RHS into a standard OSFP cage, the shape and location of the positive stop has been changed. See Table 11-1 for a comparison between the OSFP-RHS and OSFP.

Figure 11-1: Side view of a typical OSFP (top) and a typical OSFP-RHS (bottom)

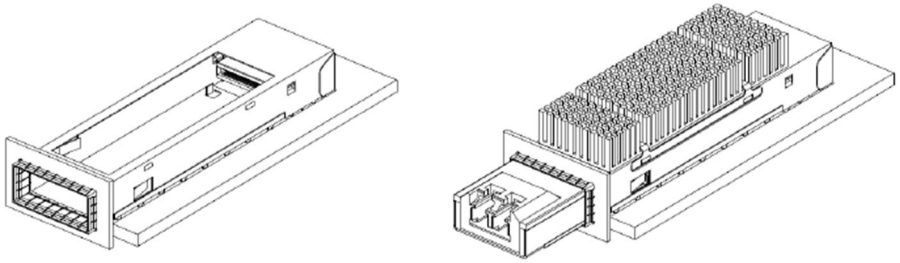


Figure 11-2: OSFP-RHS cage only (left) and OSFP-RHS cage with module and riding heat sink (right)

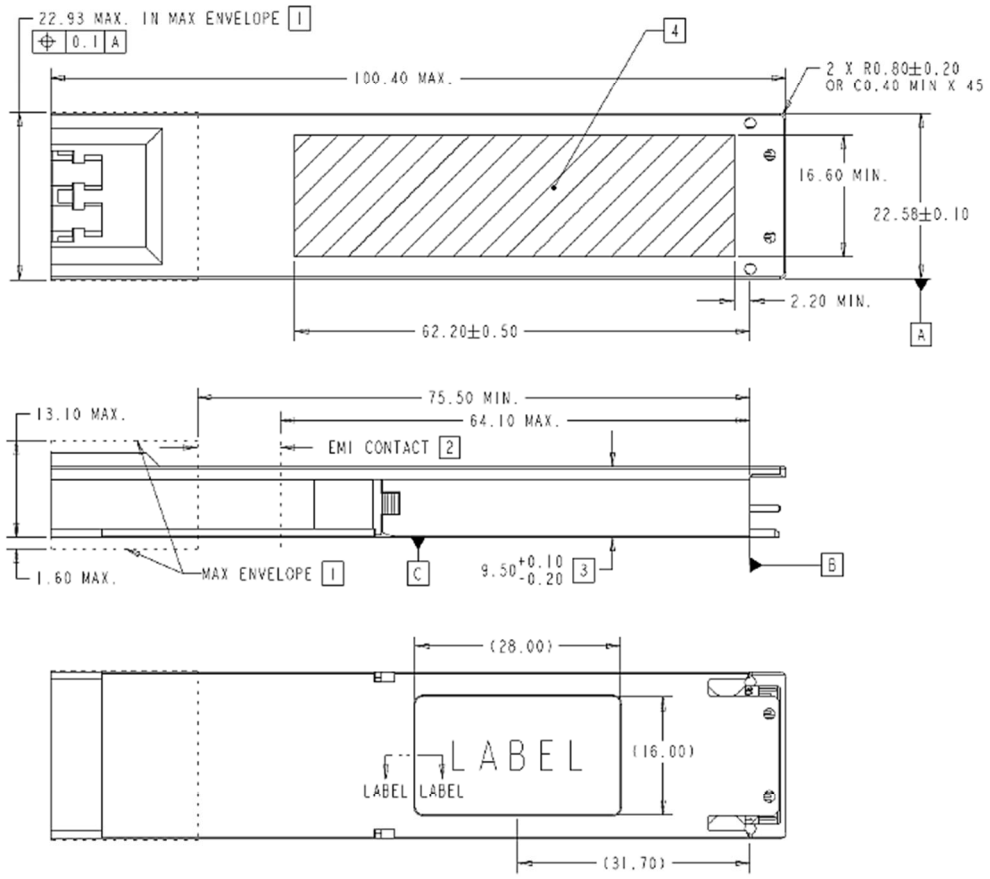
Table 11-1: Comparison of OSFP-RHS to OSFP

OSFP-RHS feature	Comment
Module	9.5mm height without heat sink and different positive stop; for the feature which is not explicitly specified for OSFP-RHS, same specification as of OSFP shall be applied.
Connector	Identical with Surface Mount Connector
Host PCB Board Layout	Identical with Surface Mount type
Cage	Port height/positive stop/bezel cutout is different with OSFP
Insertion/Extraction/Retention	No change; see Table 9-1
Durability	Identical with OSFP
Thermal Requirement	Identical with OSFP
Airflow Requirement	Not applicable (Section 10.2 is not applied)
Electrical and Management interface	Identical with OSFP

In the following sections, the dimensions of the OSFP-RHS will be defined.

11.2 OSFP-RHS Module Mechanical Specification

Figure 11-3 shows the overall dimension of an OSFP-RHS module from a top view. The reference datum definition is identical with Table 3-1, but note that the location of the datum B (forward stop of the module) is shifted 6mm to prevent an OSFP-RHS from being fully inserted into an OSFP cage as described in section 4 or 5.



NOTES:

1. FRONT OF THE MODULE, PULL TAB AND OTHER COMPONENTS CAN EXTEND 1.60mm MAX FROM THE BOTTOM AND 13.1mm MAX FROM THE BOTTOM WITH UP TO 22.93mm WIDTH IN THE MAX ENVELOPE SHOWN.
2. INDICATED SURFACES (ALL 4 SIDES) TO BE CONDUCTIVE FOR CONNECTION TO CHASSIS GROUND.
3. APPLIES FROM THE TOP OF THE MODULE TO THE BOTTOM OF THE MODULE, INSIDE THE CAGE.
4. SURFACE TO BE THERMALLY CONDUCTIVE. REFER SECTION 9.4 FOR FLATNESS AND ROUGHNESS REQUIREMENTS.

Figure 11-3: Overview of the OSFP-RHS and heat sink contact area

Contact Information

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Revision History

Date	Version	Description
03/18/2024	0.1	Preliminary release