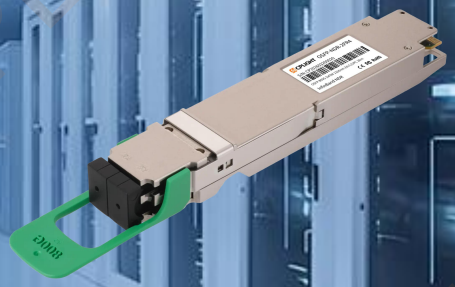
Product Specification

800GBASE 2×FR4/FR8 OSFP Finned Top PAM4
1310nm 2km DOM Dual Dual Duplex LC/UPC
SMF InfiniBand NDR Optical Transceiver Module

PN: OSFP-NDR-2FR4



Features

- Hot-pluggable OSFP Finned Top form factor
- Supports 800Gb/s nominal aggregate data rate (2×400Gb/s links)
- 8 × 106.25Gb/s PAM4 host electrical lanes
- Two independent 4 × 106.25Gb/s PAM4 optical interfaces
- Single +3.3V power supply
- Dual Duplex LC/UPC connectors
- Maximum power consumption ≤16.5W
- Two sets of 1271nm, 1291nm, 1311nm, and 1331nm CWDM optical channels
- Up to 2km over G.652 single-mode fiber
- Two 4-channel CWDM EML transmitter arrays
- 8-channel PIN receiver array
- Built-in digital diagnostic monitoring
- Requires host-side FEC
- Supports 2×400Gb/s InfiniBand NDR applications
- Commercial case temperature range of 0°C to 70°C

Compliance

- OSFP MSA
- IEEE 802.3cu (2×400GBASE-FR4 optical interfaces)
- IEEE 802.3ck (100G/lane electrical interface)
- CMIS 5.1
- RoHS
- InfiniBand Certified

Applications

- 800Gb/s aggregate InfiniBand NDR connectivity (2×400Gb/s links)
- InfiniBand NDR switch-to-switch interconnects
- InfiniBand NDR switch-to-adapter interconnects
- AI and HPC cluster interconnects
- High-density GPU cluster fabrics
- Large-scale InfiniBand network deployments

Description

The OSFP-NDR-2FR4 is a hot-pluggable OSFP Finned Top optical transceiver designed for high-density 800Gb/s aggregate InfiniBand NDR interconnects over single-mode fiber. The host-side electrical interface uses eight PAM4 lanes operating at 53.125 GBd per lane, corresponding to 106.25Gb/s per lane and an aggregate electrical signaling rate of 850Gb/s. The module incorporates two independent 400Gb/s FR4 optical engines, each connected through a dedicated Duplex LC/UPC optical interface.

Each optical engine multiplexes four PAM4 optical channels at nominal wavelengths of 1271nm, 1291nm, 1311nm, and 1331nm onto a single transmit fiber and demultiplexes the corresponding receive channels from a single receive fiber. The two Duplex LC/UPC ports operate independently as two 400Gb/s optical links, each supporting transmission distances of up to 2 kilometers over G.652 single-mode fiber.

The module operates from a single +3.3V power supply with a maximum power consumption of 16.5W and supports a commercial case temperature range of 0° C to 70° C. Digital diagnostic monitoring and module control are provided through the two-wire management interface. The Finned Top housing is designed for host systems with the corresponding OSFP thermal and airflow configuration. The OSFP-NDR-2FR4 is intended for dual-port InfiniBand NDR interconnects in AI and high-performance computing (HPC) clusters, high-density GPU computing fabrics, and other high-bandwidth networking environments.

Product performance Specifications

1、Absolute Maximum Ratings

Parameter	Symbol	Min	Typ.	Max	Unit
Storage Temperature	TS	-40		+85	°C
Supply Voltage	VCC	-0.5		3.6	V
Relative Humidity, Non-condensing	RH	5		95	%
Control Input Voltage	VI	-0.3		VCC + 0.5	V

2、Recommended Operating Conditions

Parameter	Symbol	Min	Typ.	Max	Unit
Operating Case Temperature	TC	0		70	°C
Power Supply Voltage	VCC	3.135	3.3	3.465	V
Maximum Power Dissipation	PD			16.5	W
Maximum Power Dissipation, Low Power Mode	PDLP			1.5	W
Aggregate Data Rate	DR		850		Gb/s
Electrical Lanes			8		lanes
Electrical Bit Rate per Lane			106.25		Gb/s

Signaling Rate per Lane	SRL		53.125		GBd
Modulation Format			PAM4		
Two-Wire Serial Interface Clock Rate		100		1000	kHz
Power Supply Noise Tolerance (10Hz–10MHz)				25	mV
Rx Differential Data Output Load			100		Ω
Operating Distance over G.652 SMF		2		2000	m
Pre-FEC Bit Error Ratio	BER			2.4×10^{-4}	

3、Host Electrical Interface

Parameter	Value
Number of Electrical Lanes	8
Bit Rate per Lane	106.25Gb/s
Signaling Rate per Lane	53.125GBd
Modulation Format	PAM4
Electrical Standard	IEEE 802.3ck
Twin-Port Configuration	Two groups of four electrical lanes

4、Transmitter Optical Characteristics — Per Lane

Parameter	Symbol	Min	Typ.	Max	Unit
Signaling Rate			53.125 ±100ppm		GBd
Modulation Format			PAM4		
Lane 1 / 5 Wavelength	λ1/λ5	1264.5	1271	1277.5	nm
Lane 2 / 6 Wavelength	λ2/λ6	1284.5	1291	1297.5	nm
Lane 3 / 7 Wavelength	λ3/λ7	1304.5	1311	1317.5	nm
Lane 4 / 8 Wavelength	λ4/λ8	1324.5	1331	1337.5	nm
Side-Mode Suppression Ratio	SMSR	30			dB
Average Launch Power	PAVG	-3.2		+4.4	dBm
OMAouter, TDECQ <1.4dB	TOMA	-0.2		+3.7	dBm
OMAouter, 1.4≤TDECQ≤3.4dB	TOMA	-1.6 + TDECQ		+3.7	dBm
Difference in Launch Power				3.9	dB

Between Any Two Lanes					
Transmitter and Dispersion Eye Closure	TDECQ			3.4	dB
TDECQ Minus TECQ				2.5	dB
Extinction Ratio	ER	3.5			dB
Transmitter Transition Time	Tr			17	ps
Average Launch Power of OFF Transmitter	TOFF			-16	dBm
Relative Intensity Noise	RIN21.4OMA			-136	dB/Hz
Optical Return Loss Tolerance	ORL			17.1	dB
Transmitter Reflectance	TR			-26	dB

5、Receiver Optical Characteristics — Per Lane

Parameter	Symbol	Min	Typ.	Max	Unit
Signaling Rate			53.125 ±100ppm		GBd
Modulation Format			PAM4		
Lane 1 / 5 Wavelength	λ1/λ5	1264.5	1271	1277.5	nm
Lane 2 / 6 Wavelength	λ2/λ6	1284.5	1291	1297.5	nm
Lane 3 / 7 Wavelength	λ3/λ7	1304.5	1311	1317.5	nm
Lane 4 / 8 Wavelength	λ4/λ8	1324.5	1331	1337.5	nm
Damage Threshold	AOPD	+4.5			dBm
Average Receive Power	AOPR	-7.2		+4.4	dBm
Receive Power (OMAouter)	OMA-R			+3.7	dBm
Receiver Reflectance	RR			-26	dB
Receiver Sensitivity (OMAouter)[1]	SOMA			max(-4.6, SECQ - 6.0)	dBm
Stressed Receiver Sensitivity (OMAouter)	SRS			-2.6	dBm

6、Stressed Receiver Test Conditions

Parameter	Value	Unit
Stressed Eye Closure for PAM4 (SECQ)	3.4	dB
OMAouter of Each Aggressor Lane	1.5	dBm

Pre-FEC BER	2.4×10^{-4}	

Note 1: Average launch power, each lane (minimum), is informative and is not the principal indicator of transmitter signal strength.

Note 2: Even if TDECQ is less than 1.4 dB, OMAouter, each lane, must meet the specified minimum value.

Note 3: Transmitter reflectance is defined looking into the transmitter.

Note 4: Receiver sensitivity (OMAouter), each lane, is informative and is defined for a transmitter with SECQ up to 3.4 dB. Receiver sensitivity shall meet RS = max(-4.6, SECQ - 6.0) dBm.

Note 5: Stressed receiver sensitivity is measured using a conformant PAM4 test signal at TP3 with a pre-FEC BER of 2.4×10^{-4}.

Note 6: The module contains two independent 400GBASE-FR4 optical engines. Each Duplex LC/UPC port uses four CWDM wavelengths at nominal centers of 1271nm, 1291nm, 1311nm, and 1331nm.

Recommended Host Board Power Supply Circuit

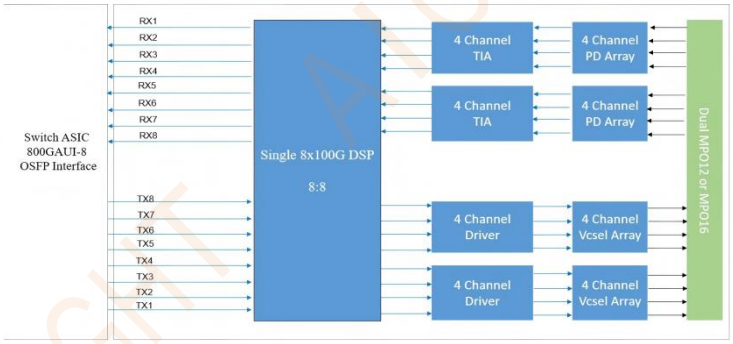


Figure 1: Module Block Diagram

Recommended Interface Circuit

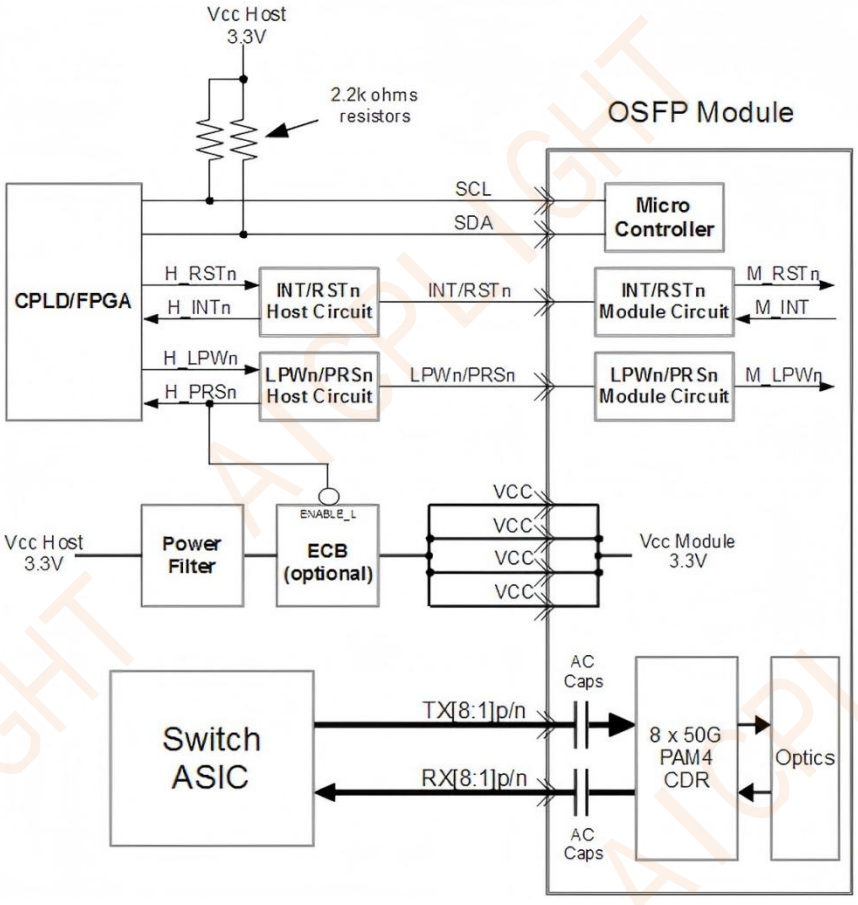


Figure2: Recommended Interface Circuit

Optical Interface

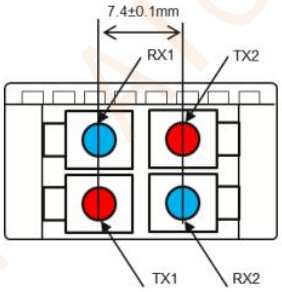


Figure3: Optical Lane Sequence

Pin-out Definition

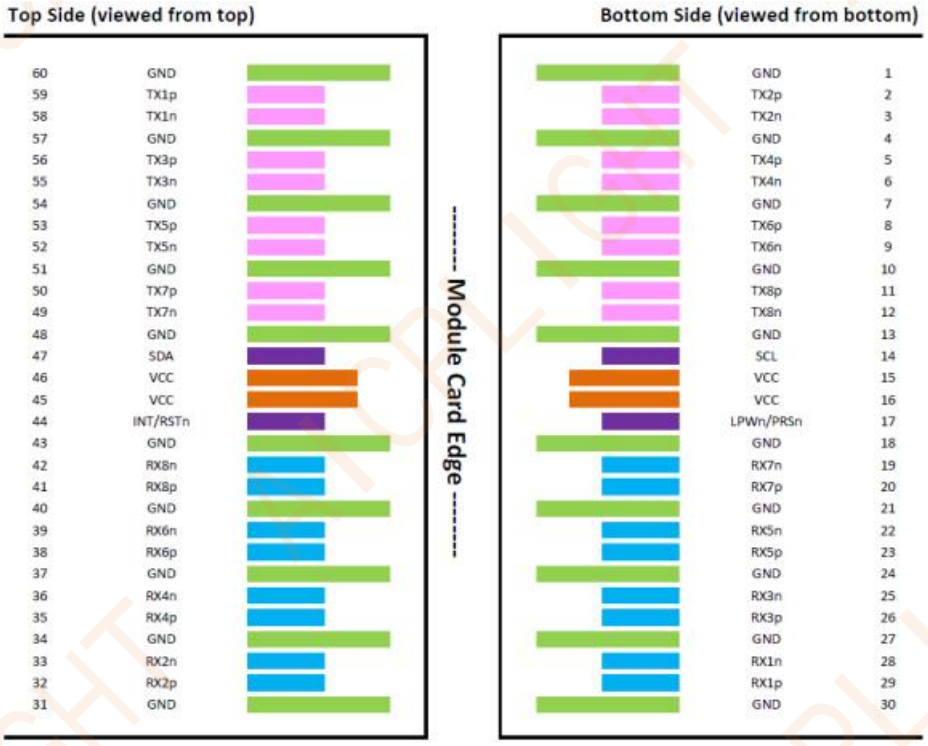


Figure4: Pin view(OSFP)

Pin Function Definitions

Pin	Logic	Symbol	Description	Note
1		GND	Ground	
2	CML-I	TX2p	Transmitter Data Non-Inverted	
3	CML-I	TX2n	Transmitter Data Inverted	
4		GND	Ground	
5	CML-I	TX4p	Transmitter Data Non-Inverted	

6	CML-I	TX4n	Transmitter Data Inverted	
7		GND	Ground	
8	CML-I	TX6p	Transmitter Data Non-Inverted	
9	CML-I	TX6n	Transmitter Data Inverted	
10		GND	Ground	
11	CML-I	TX8p	Transmitter Data Non-Inverted	
12	CML-I	TX8n	Transmitter Data Inverted	
13		GND	Ground	
14	LVCMOS-I/O	SCL	2-wire Serial interface clock	1
15		VCC	+3.3V Power	
16		VCC	+3.3V Power	
17	Multi-Level	LPWn/PRSn	Low-Power Mode / Module Present	2
18		GND	Ground	
19	CML-O	RX7n	Receiver Data Inverted	
20	CML-O	RX7p	Receiver Data Non-Inverted	
21		GND	Ground	
22	CML-O	RX5n	Receiver Data Inverted	
23	CML-O	RX5p	Receiver Data Non-Inverted	
24		GND	Ground	
25	CML-O	RX3n	Receiver Data Inverted	
26	CML-O	RX3p	Receiver Data Non-Inverted	
27		GND	Ground	
28	CML-O	RX1n	Receiver Data Inverted	
29	CML-O	RX1p	Receiver Data Non-Inverted	
30		GND	Ground	
31		GND	Ground	
32	CML-O	RX2p	Receiver Data Non-Inverted	
33	CML-O	RX2n	Receiver Data Inverted	
34		GND	Ground	
35	CML-O	RX4p	Receiver Data Non-Inverted	
36	CML-O	RX4n	Receiver Data Inverted	
37		GND	Ground	
38	CML-O	RX6p	Receiver Data Non-Inverted	
39	CML-O	RX6n	Receiver Data Inverted	
40		GND	Ground	
41	CML-O	RX8p	Receiver Data Non-Inverted	
42	CML-O	RX8n	Receiver Data Inverted	
43		GND	Ground	
44	Multi-Level	INT/RSTn	Module Interrupt / Module Reset	2
45		VCC	+3.3V Power	

46		VCC	+3.3V Power	
47	LVCMOS-I/O	SDA	2-wire Serial interface data	1
48		GND	Ground	
49	CML-I	TX7n	Transmitter Data Inverted	
50	CML-I	TX7p	Transmitter Data Non-Inverted	
51		GND	Ground	
52	CML-I	TX5n	Transmitter Data Inverted	
53	CML-I	TX5p	Transmitter Data Non-Inverted	
54		GND	Ground	
55	CML-I	TX3n	Transmitter Data Inverted	
56	CML-I	TX3p	Transmitter Data Non-Inverted	
57		GND	Ground	
58	CML-I	TX1n	Transmitter Data Inverted	
59	CML-I	TX1p	Transmitter Data Non-Inverted	
60		GND	Ground	

Note1: Open-Drain with pull up resistor on Host.

Note2: See pin description for required circuit.

Monitoring Specification

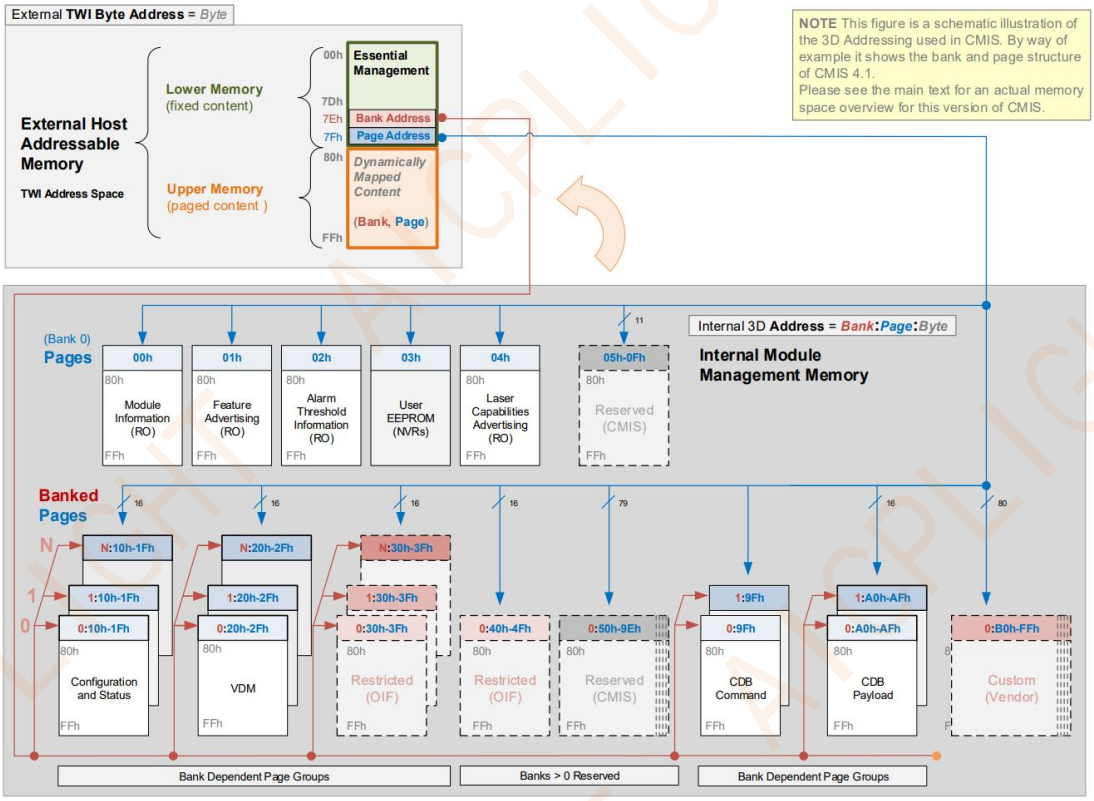
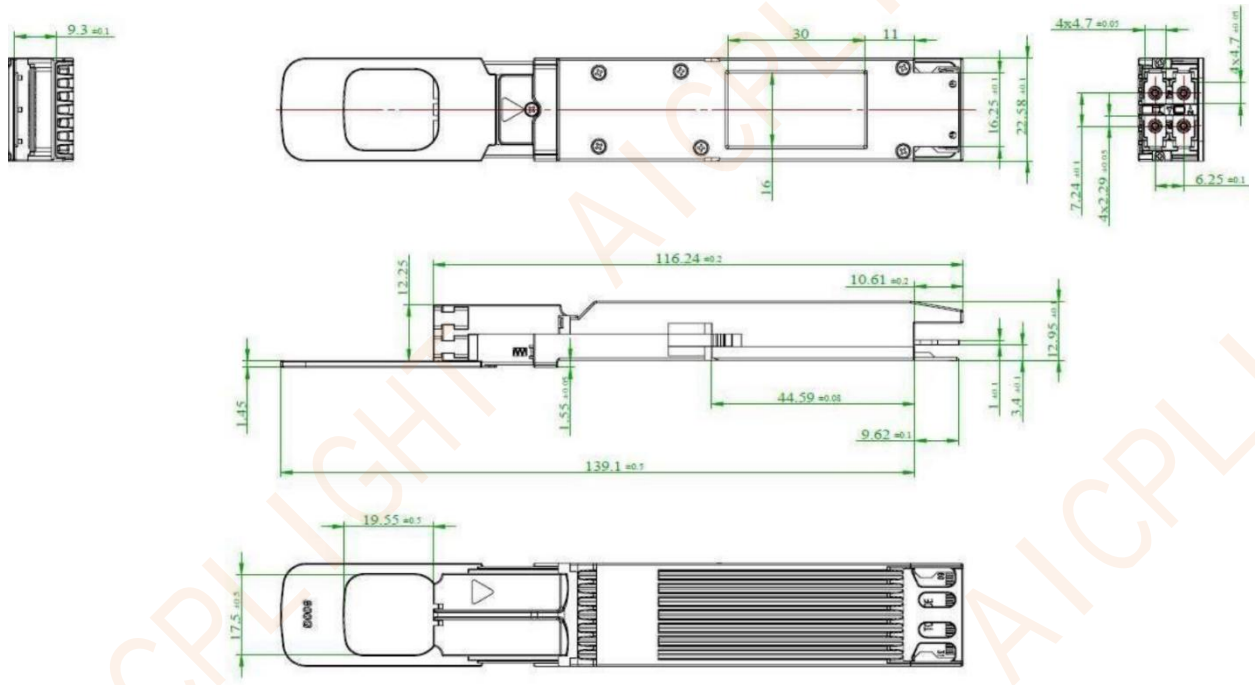


Figure5: Memory map

Memory map Table

Byte	Unit	Name	Description
Lower Page 00h			
0-2	3	Management Characteristics	Basic Information about how this module is managed
3	1	Global Status Information	Current state of Module, Interrupt signal status
4-7	4	Flag Summary	Summary of Flags set on specific Pages (and Banks)
8-13	6	Module-Level Flags	Flags that are not lane or Data Path specific
14-25	12	Module-Level Monitors	Monitors that are not lane or Data Path specific
26-30	5	Module-Level Controls	Controls applicable to the module as a whole
31-36	6	Module-Level Masks	Mask bits for the Module-Level Flags
37-38	2	CDB Command Status	Status of current CDB command
39-40	2	Module Active Firmware Version	Module Active Firmware Version number
41	1	Fault Information	Fault cause for entering ModuleFault state
42-63	22		Reserved
64-84	21		Custom
85-117	33	Supported Applications Advertising	Applications supported by module Data Path(s)
118-125	8	Password Facilities	Password Entry and Change (mechanism only)
126-127	2	Page Mapping	Page mapping into host addressable Upper Memory
Upper Page 00h			
128	1	SFF8024IdentifierCopy	Copy of Byte 00h:0
129-144	16	VendorName	Vendor name (ASCII)
145-147	3	Vendor OUI	Vendor IEEE company ID
148-163	16	Vendor PN	Part number provided by vendor (ASCII)
164-165	2	Vendor Rev	Revision level for part number provided by vendor (ASCII)
166-181	16	Vendor SN	Vendor Serial Number (ASCII)
182-189	8	DateCode	Manufacturing Date Code (ASCII)
190-199	10	CLEICode	Common Language Equipment Identification Code (ASCII)
200-201	2	ModulePowerCharacteristics	Module power characteristics
202	1	CableAssemblyLinkLength	Cable length (for cable assembly modules only)
203	1	ConnectorType	Connector type of the media interface
204-209	6	Copper Cable Attenuation	Attenuation characteristics (passive copper cables only)
210	1	MediaLaneInformation	Supported near end media lanes (all modules)
211	1	Cable Assembly Information	Far end modules information (cable assemblies only)
212	1	MediaInterfaceTechnology	Information on media side device or cable technology
213-220	8		Reserved
221	1		Custom
222	1	PageChecksum	Page Checksum over bytes 128-221
223-255	33		Custom

Mechanical Dimension



Handling and Safety Precautions:

- **ESD Protection:** Use proper electrostatic discharge (ESD) protection when handling, installing, or removing the module.
- **Installation and Removal:** Insert or remove the OSFP module using the pull tab or release mechanism. Do not force the module into the cage or pull on the fiber cable.
- **Form Factor Compatibility:** OSFP Flat Top and OSFP Finned Top modules are designed for different thermal and cage configurations and are not interchangeable. Always use the module type specified for the host system.
- **Thermal Management:** Ensure sufficient airflow and proper heatsink contact. Do not obstruct the module or system cooling path, as the module may become hot during operation.
- **Connector Cleaning:** Keep MTP/MPO or LC optical interfaces clean and protected with dust caps when not in use. Clean connector end faces before connection.
- **Fiber Handling:** Avoid excessive bending, pulling, twisting, or crushing of fiber cables. Follow the specified minimum bend radius.
- **Laser Safety:** Do not look directly into the optical port or connected fiber while the module is powered. Do not disassemble or modify the module.

Ordering Information

PN	Description
OSFP-NDR-2SR4	800GBASE 2×SR4/SR8 OSFP Finned Top PAM4 850nm 50m DOM Dual MTP/MPO-12 APC MMF InfiniBand NDR Optical Transceiver Module
OSFP-NDR-2DRL4	800GBASE 2×DRL4/DRL8 OSFP Finned Top PAM4 1310nm 100m DOM Dual MTP/MPO-12 APC SMF InfiniBand NDR Optical Transceiver Module
OSFP-NDR-2DRL4	800GBASE 2×DR4/DR8 OSFP Finned Top PAM4 1310nm 100m DOM Dual MTP/MPO-12 APC SMF InfiniBand NDR Optical Transceiver Module
OSFP-NDR-2FR4	800GBASE 2×FR4/FR8 OSFP Finned Top PAM4 1310nm 2km DOM Dual Dual Duplex LC/UPC SMF InfiniBand NDR Optical Transceiver Module