

Asterfusion 800G OSFP DR8 MPO-16 SMF

500m Optical Transceiver

Features

- 8 x 100G PAM4 electrical modulation
- 8 x 100G PAM4 optical modulation
- Maximum 500m on SMF
- Power consumption <16.5W
- Hot Pluggable OSFP form factor
- MPO-16 APC connector receptacle
- 8 channels 1310nm EML array
- 8 channels PIN photo detector array
- 5nm Marvell DSP with KP-FEC
- Internal CDR circuits on both receiver and transmitter channels
- I2C interface is supported to read and control the status of this product
- Built-in digital diagnostic functions
- Compliant with CMIS
- Operating case temperature 0°C to +70°C
- 3.3V power supply voltage
- Class 1 laser safety

Overview

The Asterfusion OSFP 800G DR8 500m optical transceiver is a low-power, high-density, pluggable OSFP module designed for 800 Gigabit Ethernet applications. This transceiver is a high-performance module for datacenter-range multi-lane interconnection and data transmission. It integrates 8 data lanes in each direction, operating at 8×53.125 GBd. Each lane can achieve 106.25 Gbps, supporting distances up to 500m over SMF fiber.

The module supports single-mode fiber systems with a nominal wavelength of 1310 nm. The optical interface uses 16-fiber MTP (MPO) connectors. It supports digital diagnostic functions and is fully compatible with the Common Management Interface Specification (CMIS).

Product Applications

- AI Training Fabric
- AI Inference Fabric
- Data Center Fabric
- Ethernet Storage Fabric
- HPC (High Performance Computing)
- Supercomputer
- Telecom Backbone

Block Diagram

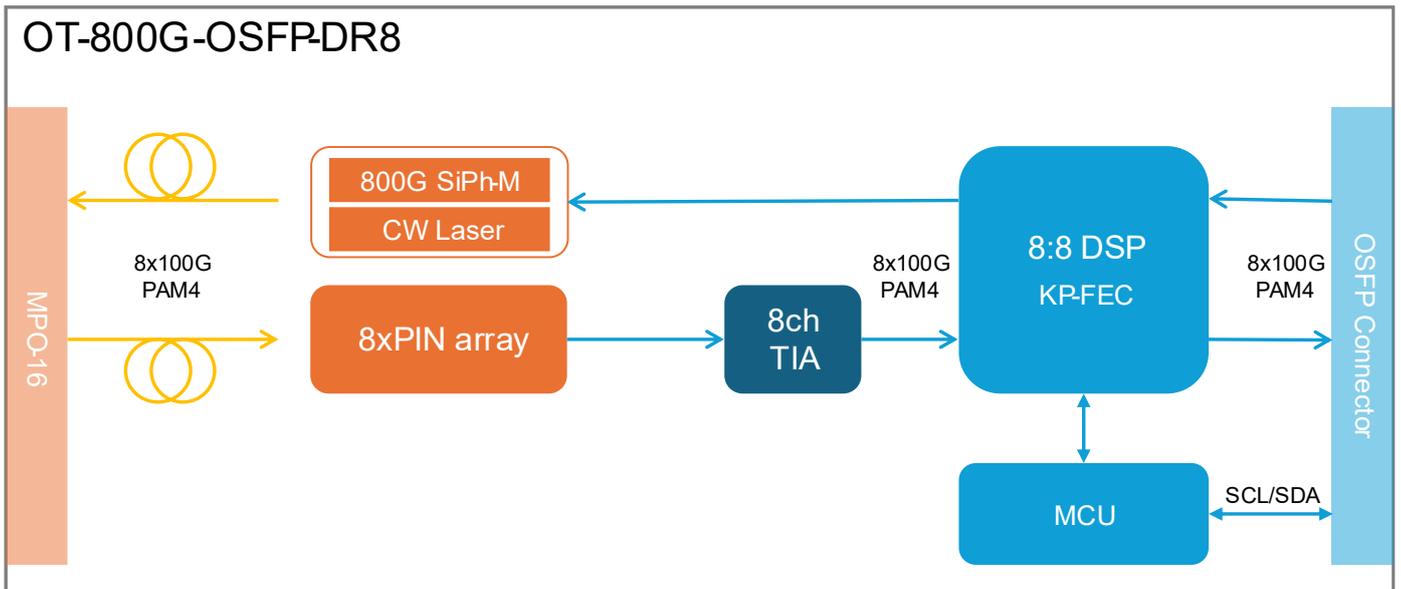


Figure 1 The 800G OSFP DR8 Optical Transceiver Block Diagram

Networking

Connect two 800G-port switches with MPO-16 single-mode fiber cable.



Figure 2 Connect two 800G-port switches

Connect 1 x 800G-port switch to 2 x 400G-port switches with MPO-16 to 2 MPO-12 breakout cable.



Figure 3 Connect 1 x 800G-port switch to 2 x 400G-port switches

Connect 1 x 800G-port switch to 8 x 100G NICs with MPO-16 to 8 LC Duplex breakout cable.

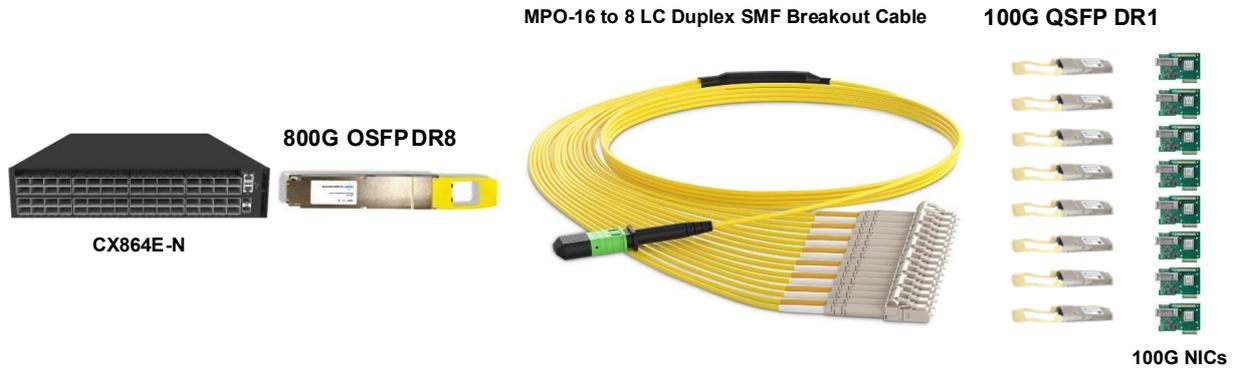


Figure 4 Connect 1 x 800G-port switch to 8 x 100G NICs

Specifications

Electrical Specifications

Parameter	Test Point	Min	Typical	Max	Units	Notes
Power Consumption				16.5	W	
Supply Current	I _{cc}			5	A	
Pre-FEC Bit Error Ratio (BER)			2.4E-4			
Post-FEC Bit Error Ratio (BER)			1.0E-15			
Link Distance				500	m	
Data Rate Accuracy		-100		+100	ppm	
Module input (each Lane)						
Signaling Rate, each Lane	TP1	53.125 ± 100 ppm			GBd	
Differential pk-pk voltage tolerance	TP1a	750			mV	

Peak-to-peak AC common-mode voltage tolerance Low-frequency, VCM_{LF} High-frequency, VCM_{FB}	TP1a	32 80			mV	
Differential-mode to common-mode return loss, RL_{cd}	TP1	Equation (120G-2)			dB	
Effective return loss, ERL	TP1	8.5			dB	
Differential termination mismatch	TP1			10	%	
Module stressed input tolerance	TP1a	See 120G.3.4.3				[1]
Single-ended voltage tolerance range	TP1a	-0.4		3.3	V	
DC common-mode voltage tolerance	TP1	-350		2850	mV	[2]
Module output (each Lane)						
Signaling Rate, each lane	TP4	53.125			GBd	[3]
Peak-to-peak AC common-mode voltage Low-frequency, VCM_{LF} Full-band, VCM_{FB}	TP4			32 80	mV	
Differential peak-to-peak output voltage Short mode Long mode	TP4			600 845	mV mV	
Eye height, differential	TP4	15			mV	

Vertical eye closure	TP4			12	dB	
Common-mode to differential-mode return loss	TP4	Equation (120G-1)			dB	
Effective return loss, ERL	TP4	8.5			dB	
Differential termination mismatch	TP4			10	%	
Transition time (20% to 80%)	TP4	8.5			ps	
DC common-mode output voltage	TP4	-350		2850	mV	[2]

Notes:

1. Meets BER specified in 120G.1.1.
2. DC common-mode voltage generated by the host. Specification includes effects of ground offset voltage.
3. The signaling rate range is derived from the PMD receiver input.

Optical Characteristics

Parameter	Symbol	Min	Typical	Max	Units	Notes
Center Wavelength	λ_c	1304.5	1310	1317.5	nm	
Transmitter						
Data Rate, each Lane		53.125 \pm 100 ppm			GBd	
Modulation Format		PAM4				
Side-mode Suppression Ratio	SMSR	30			dB	
Average Launch Power, each Lane	P_{AVG}	-2.9		4	dBm	[1]
Outer Optical Modulation Amplitude (OMA_{outer}), each Lane	P_{OMA}	-0.8		4.2	dBm	[2]

LOS Assert	LOSA	-15		-9.9	dBm	
LOS De-assert	LOSD			-6.9	dBm	
LOS Hysteresis	LOSH	0.5			dB	
Stressed Conditions for Stress Receiver Sensitivity [9]						
Stressed Eye Closure for PAM4 (SECQ), Lane under Test			3.4		dB	
SECQ – $10 \cdot \log_{10}(C_{eq})$, Lane under Test				3.4	dB	

Note:

1. Average launch power, each lane (min) is informative and not the principal indicator of signal strength. A transmitter with launch power below this value cannot be compliant; however, a value above this does not ensure compliance.
2. For 100GBASE-DR, the requirement on the OMA_{outer} (min) applies even in the cases where $TDECQ < 1.4\text{dB}$ for an extinction ratio of $\geq 5\text{dB}$ or where $TDECQ < 1.1\text{dB}$ for an extinction ratio of $< 5\text{dB}$.
3. C_{eq} is a coefficient defined in IEEE Std 802.3-2018 clause 121.8.5.3 which accounts for the reference equalizer noise enhancement.
4. Transmitter reflectance is defined looking into the transmitter.
5. The receiver shall be able to tolerate, without damage, continuous exposure to a modulated optical input signal having this power level on one lane. The receiver does not have to operate correctly at this input power.

- 6. Average receive power, each lane (min) is informative and not the principal indicator of signal strength. A received power below this value cannot be compliant; however, a value above this does not ensure compliance.
- 7. Receiver sensitivity (OMA_{outer}) is informative and is defined for a transmitter with a value of SECQ up to 3.4dB. Receiver sensitivity should meet Equation (1), which is illustrated in Figure 5.

$$RS = \max(-3.9, SECQ - 5.3) \text{ dBm} \tag{1}$$

Where:

RS is the receiver sensitivity, and

SECQ is the SECQ of the transmitter used to measure the receiver sensitivity.

- 8. Measured with conformance test signal at TP3 for the BER equal to 2.4×10^{-4} .
- 9. These test conditions are for measuring stressed receiver sensitivity. They are not characteristics of the receiver.

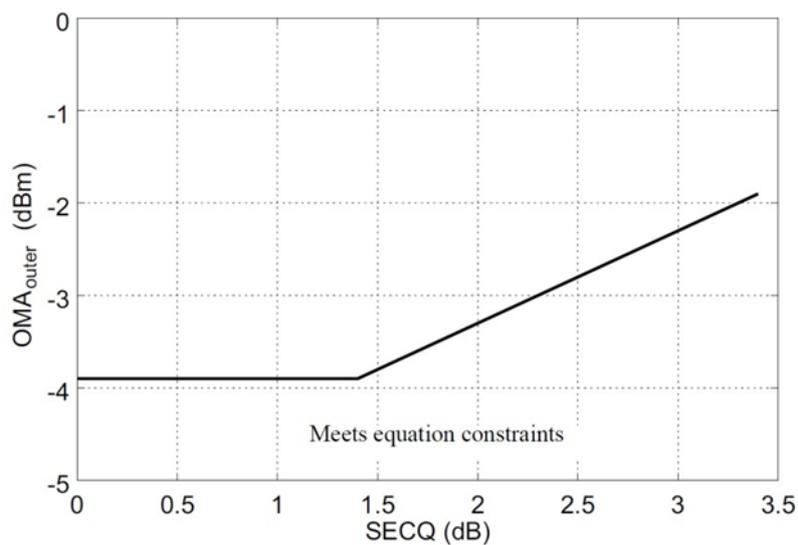


Figure 5 Illustration of Receiver Sensitivity Mask for 800G-DR8

Optical Interface Lanes and Assignment

The optical interface port is an MPO-16 APC receptacle. The transmit and receive optical lanes shall occupy the positions depicted in Figure 6.

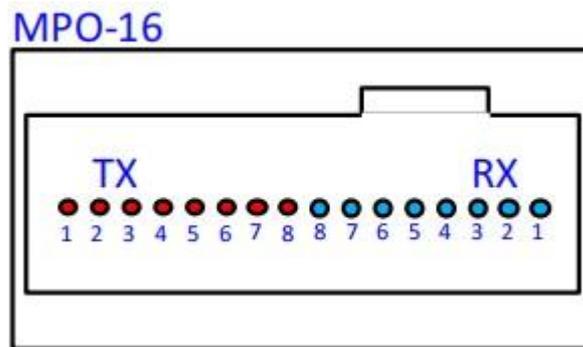


Figure 6 Optical Receptacle and Channel Orientation

Mechanical Dimensions

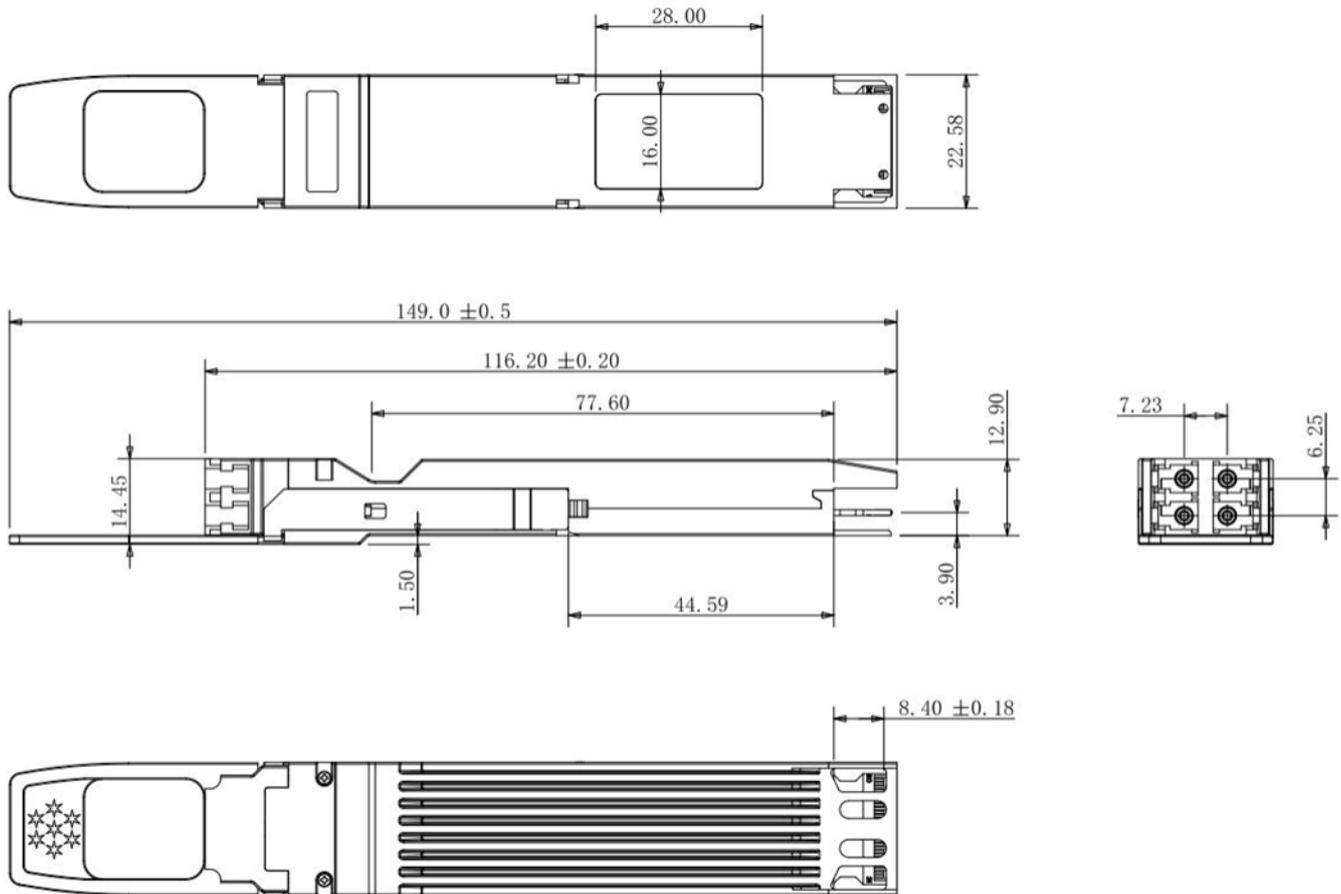


Figure 7 Mechanical Specifications (mm)

Absolute Maximum Ratings

Parameter	Symbol	Min	Max	Units	Notes
Storage Temperature	T_s	-40	85	°C	
Operating Case Temperature	T_{OP}	0	70	°C	
Power Supply Voltage	V_{CC}	-0.5	3.6	V	
Relative Humidity (non-condensation)	RH	0	85	%	

Recommended Operating Conditions

Parameter	Symbol	Min	Typical	Max	Units	Notes
Operating Case Temperature	T_{OP}	0		70	°C	



Power Supply Voltage	V _{cc}	3.135	3.3	3.465	V	
Data Rate, each Lane			53.125		GBd	PAM4
Link Distance	D			500	m	2

PIN Description

The optical transceiver complies with the OSFP MSA Specification, see www.osfpmsa.org.

OSFP Pin Description

Pin	Symbol	Description	Logic	Direction
1	GND	Ground		
2	TX2p	Transmitter Data Non- Inverted	CML-I	Input from Host
3	TX2n	Transmitter Data Inverted	CML-I	Input from Host
4	GND	Ground		
5	TX4p	Transmitter Data Non- Inverted	CML-I	Input from Host
6	TX4n	Transmitter Data Inverted	CML-I	Input from Host
7	GND	Ground		
8	TX6p	Transmitter Data Non- Inverted	CML-I	Input from Host
9	TX6n	Transmitter Data Inverted	CML-I	Input from Host
10	GND	Ground		
11	TX8p	Transmitter Data Non- Inverted	CML-I	Input from Host
12	TX8n	Transmitter Data Inverted	CML-I	Input from Host
13	GND	Ground		
14	SCL	2-wire Serial interface clock	LVC MOS-I/O	Bi- directional
15	VCC	+3.3V Power		Power from Host



16	VCC	+3.3V Power		Power from Host
17	LPWn/PRSn	Low-Power Mode / Module Present	Multi-Level	Bi- directional
18	GND	Ground		
19	RX7n	Receiver Data Inverted	CML-O	Output to Host
20	RX7p	Receiver Data Non-Inverted	CML-O	Output to Host
21	GND	Ground		
22	RX5n	Receiver Data Inverted	CML-O	Output to Host
23	RX5p	Receiver Data Non-Inverted	CML-O	Output to Host
24	GND	Ground		
25	RX3n	Receiver Data Inverted	CML-O	Output to Host
26	RX3p	Receiver Data Non-Inverted	CML-O	Output to Host
27	GND	Ground		
28	RX1n	Receiver Data Inverted	CML-O	Output to Host
29	RX1p	Receiver Data Non-Inverted	CML-O	Output to Host
30	GND	Ground		
31	GND	Ground		
32	RX2p	Receiver Data Non-Inverted	CML-O	Output to Host
33	RX2n	Receiver Data Inverted	CML-O	Output to Host
34	GND	Ground		
35	RX4p	Receiver Data Non-Inverted	CML-O	Output to Host
36	RX4n	Receiver Data Inverted	CML-O	Output to Host
37	GND	Ground		
38	RX6p	Receiver Data Non-Inverted	CML-O	Output to Host
39	RX6n	Receiver Data Inverted	CML-O	Output to Host
40	GND	Ground		
41	RX8p	Receiver Data Non-Inverted	CML-O	Output to Host
42	RX8n	Receiver Data Inverted	CML-O	Output to Host
43	GND	Ground		
44	INT/ RSTn	Module Interrupt / Module Reset	Multi-Level	Bi- directional



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

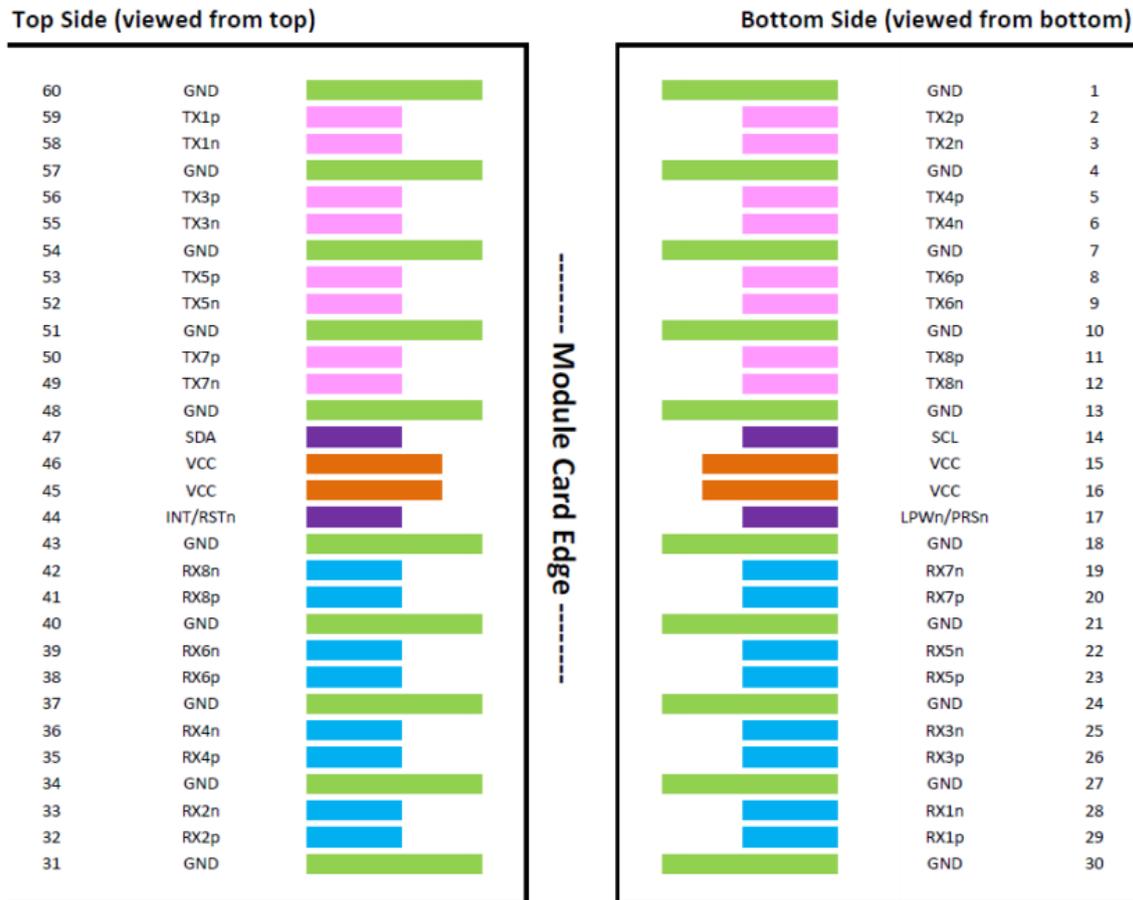


Figure 8 Electrical Pin-out Details

OSFP Control Signals

Name	Function	Description
LPWn/PRSn	Input/output	Multi-level signal for low power control from host to module and module presence indication from module to host. This signal requires the circuit as described in the OSFP Specification.
INT/RSTn	Input/output	Multi-level signal for interrupt request from module to host and reset control from host to module. This signal

		requires the circuit as described in the OSFP Specification.
SCL	Bidir	2-wire serial clock signal. Requires pull-up resistor to 3.3V on host.
SDA	Bidir	2-wire serial data signal. Requires pull-up resistor to 3.3V on host.

Digital Diagnostic Specification

Parameter	Symbol	Min	Max	Units	Notes
Temperature monitor absolute error	DMI_Temp	-3	+3	°C	Over operating temperature range
Supply voltage monitor absolute error	DMI_VCC	-0.1	0.1	V	Over full operating range
Channel RX power monitor absolute error	DMI_RX_Ch	-2	+2	dB	[1]
Channel Bias current monitor	DMI_Ibias_Ch	-10%	+10%	mA	
Channel TX power monitor absolute error	DMI_TX_Ch	-2	2	dB	[1]

Notes:

- [1]. Due to measurement accuracy of different single mode fibers, there could be an additional +/-1 dB fluctuation, or a +/- 3 dB total accuracy.

Regulatory Compliance

Asterfusion OT-800G-OSFP-DR8 transceivers are Class 1 Laser Products. They are certified per the following

standards:

Feature	Standard
Laser Safety	IEC 60825-1:2014 (3 rd Edition) IEC 60825-2:2004/AMD2:2010 EN 60825-1-2014 EN 60825-2:2004+A1+A2 FDA 21 CFR 1040.10 and 1040.11 except for conformance with IEC 60825-1 Ed. 3., as described in Laser Notice No. 56, dated May 8, 2019.
Electrical Safety	EN 62368-1: 2014 IEC 62368-1:2014 UL 62368-1:2014
Environmental protection	Directive 2011/65/EU with amendment (EU)2015/863
CE EMC	EN55032: 2015 EN55035: 2017 EN61000-3-2:2014 EN61000-3-3:2013
FCC	FCC Part 15, Subpart B ANSI C63.4-2014

References

1. OSFP MSA Specification - Rev 5.22
2. CMIS
3. IEEE 802.3df 800GBASE-DR8 Ethernet (PAM4)

ESD

This transceiver is specified as ESD (Electrostatic Discharge) threshold 1kV for high-speed data pins and 2kV for

all other electrical input pins, tested per MIL-STD-883, Method 3015.4 / JESD22-A114-A (HBM). However, normal ESD precautions are still required during the handling of this module. This transceiver is shipped in ESD protective packaging. It should be removed from the packaging and handled only in an ESD protected environment.

Order Information

Part Number	Description
OT-800G-OSFP-DR8	800G, OSFP, DR8, MPO-16 APC, SMF 1310nm, 500m, 16.5W

Warranty and Service Support

Asterfusion optical transceivers come with 2-year Basic H/W service and warranty, preloaded perpetual licensed AsterNOS and 1-year AsterNOS upgrade subscription.

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