DRIVENETS

DATASHEET

OPTICAL TRANSCEIVER · OSFP224 LRO · RIDING HEAT SINK

DriveNets 1.6T 2×DR4 LRO

OSFP224 linear receive optics transceiver with dual MPO-12 interfaces and riding heat sink, delivering 8 × 212.5 Gbps PAM4 as two 800G-DR4 links at 16 W maximum for low-power 1.6TbE and AI cluster interconnect.

1.6 Tbps

AGGREGATE LINE RATE

8 × 212.5G PAM4

Dual MPO-12 · 500 m

16 W maximum



OVERVIEW

The DriveNets 1.6T OSFP224 2×DR4 LRO is a hot-pluggable linear receive optics transceiver that transmits and receives serial optical data at 212.5 Gbps per channel using PAM4 modulation over single-mode fiber. Eight 106.25 GBd host electrical lanes map one-to-one onto eight optical lanes presented on two MPO-12 interfaces with 8° APC endfaces, giving 1.6 Tbps as two independent 800G-DR4 links at reaches up to 500 m. On the receive path the module uses a PAM4 TIA with a linear electrical output (0.25 - 0.5 V VMA, host-requestable 300 - 700 mV_{pp}) instead of a receive DSP, for a maximum power consumption of 16 W. It integrates a high-performance silicon-photonics modulator and a riding heat sink (RHS) in an OSFP224 form factor, and is compliant with IEEE P802.3dj D2.0, the OIF 2024.522.02 LRO implementation agreement, the OSFP MSA rev 5.2 and OIF-CMIS 5.3 management, across a 0 °C to +70 °C case-temperature range.

Optical interface

Dual MPO-12, 8° APC · 8 lanes at 212.5 Gbps PAM4

1304.5 - 1317.5 nm · 500 m over single-mode fiber

Class 1 laser product per IEC 60825-1

Electrical & management

60-contact edge connector · 8 × 106.25 GBd host lanes

Linear receive output · VMA 0.25 - 0.5 V · EECQ 8 dB max

IEEE P802.3dj D2.0 · OIF 2024.522.02 LRO · OIF-CMIS 5.3

Power & environmental

16 W maximum power consumption

0 °C to +70 °C case · riding heat sink (RHS)

RoHS II 2011/65/EU · digital diagnostics monitoring

HARDWARE SPECIFICATION

Key specifications

Ordering & package

Part number	**DNOT00002**
Form factor	**OSFP224 LRO, riding heat sink (RHS)**
Optical interface	**Dual MPO-12, 8° APC**
Data rate	**1.6T (8 × 212.5 Gbps PAM4)**
Reach	**500 m single-mode fiber**

Electrical - linear receive

Supply voltage (VCC)	**3.135 - 3.465 V**
Host baud rate per lane	**106.25 GBd ±50 ppm**
Power consumption	**16 W maximum**
Output, host-requestable	**300 - 700 mVpp**
Output, initial range	**300 - 600 mVpp**
Voltage modulation amplitude	**0.25 - 0.5 V**
Electrical eye closure (EECQ)	**8 dB max**
Effective return loss	**8.5 dB (TP1) / 9 dB (TP4)**

Optical - transmitter

Modulation format	**PAM4**
Lane wavelength	**1304.5 - 1317.5 nm**
Output power (PAVG)	**-3.3 to 4 dBm**
OMAouter, TDECQ < 0.9 dB	**-0.3 to 4.2 dBm**
TDECQ / TECQ, max	**3.4 dB**
Side-mode suppression	**30 dB min**
Extinction ratio	**3.5 dB min**

Environmental

Operating case temp	**0 °C - +70 °C**
Storage temperature	**-40 °C - +85 °C**
Relative humidity	**5% - 85%**
VCC absolute maximum	**-0.3 V - +3.6 V**
Cooling	**Riding heat sink (RHS)**

Optical - receiver

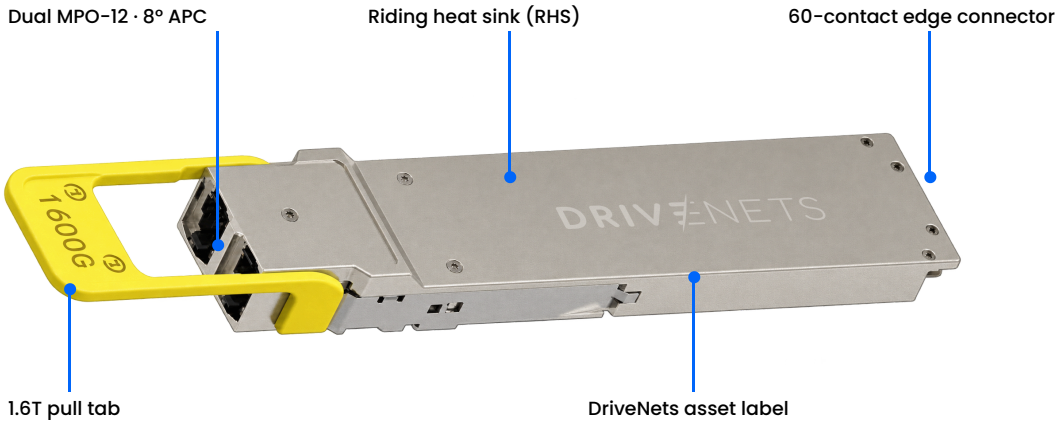
Average receive power	**-6.3 to 4 dBm**
Sensitivity (OMAouter)	**-3.4 dBm @ 2.4E-4**
Stressed sensitivity	**-0.9 dBm**
Damage threshold	**5 dBm per lane**
Receiver reflectance	**-26 dB max**

Management & DDM

Host interface	**60-contact edge connector**
Memory map	**OIF-CMIS 5.3**
Temperature / voltage	**±3 °C / ±0.1 V**
Tx bias current, per lane	**±10%**
Tx / Rx power, per lane	**±3 dB**

INTERFACE OVERVIEW

Module layout



REGULATORY COMPLIANCE

Certifications

EMC

FCC 47 CFR Part 15, Class B

EN 55032:2015+A11:2020+A1:2020

EN 55035:2017+A11:2020

IEC 61000-4-3:2020

IEC EN 61000-4-2:2008

Product safety

CB: IEC 62368-1:2018

TÜV Mark: EN IEC 62368-1:2020+A11

UL Recognized Component: UL 62368-1:2019 R10.21, CSA C22.2 No. 62368-1:19

Optical & environmental

Class 1 laser product

FDA/CDRH

IEC 60825-1:2014

IEC 60825-2:2021

EN 60825-1:2014+A11

Complies with RoHS II Directive 2011/65/EU

1.6 Tbps
AGGREGATE LINE RATE

8 × 212G
PAM4 OPTICAL LANES

500 m
REACH OVER SMF

16 W
MAXIMUM POWER

APPLICATIONS & STANDARDS

Applications

- AI cluster interconnection
- 1600GBASE-DR8 Ethernet
- Datacenters
- Other 1.6T interconnect

Reference documents

- OIF-CMIS-05.3 - common management interface specification (CMIS) rev 5.3
- OSFP MSA specification for OSFP octal small form factor pluggable module rev 5.2
- IEEE P802.3dj™-D2.0
- OIF 2024.522.02

RATINGS

Absolute maximum ratings

PARAMETER	SYMBOL	MIN	MAX	UNIT
Storage temperature range	T_S	**-40**	**+85**	°C
Relative humidity	RH	**5**	**85**	%
Power supply voltage	V_{CC}	**-0.3**	**+3.6**	V
Rx damage threshold, per lane			**5**	dBm

1. Modules operating outside of this range may get permanently damaged.

OPERATING CONDITIONS

Recommended operating conditions

PARAMETER	SYMBOL	MIN	TYP	MAX	UNIT
Operating case temperature	T_C	**0**	**/**	**70**	°C
Power supply voltage	V_{CC}	**3.135**	**3.3**	**3.465**	V
Host baud rate (per channel)	BR	**106.25 -50 ppm**	**106.25**	**106.25 +50 ppm**	GBd

1. Modules operating outside of this range do not have the performance guaranteed.

MONITORING

DDM accuracy

PARAMETER	ACCURACY	UNIT	CALIBRATION
Temperature	**±3**	°C	Internal
Voltage	**±0.1**	V	Internal
Tx bias current (each lane)	**±10**	%	Internal
Tx output power (each lane)	**±3**	dB	Internal
Rx receive power (each lane)	**±3**	dB	Internal

MANAGEMENT

Memory map

Refer to OIF-CMIS - common management interface specification (CMIS).

Optical characteristics

The following optical characteristics are defined over the recommended operating conditions unless otherwise specified.

PARAMETER	SYMBOL	MIN	TYP	MAX	UNIT	NOTES
Transmitter (per lane)						
Signaling speed		**106.25 -50 ppm**	**106.25**	**106.25 +50 ppm**	GBd	
Modulation format			**PAM4**			
Lane wavelength		**1304.5**	**-**	**1317.5**	nm	
Side-mode suppression ratio	SMSR	**30**			dB	
Optical output power	P_{AVG}	**-3.3**		**4**	dBm	1
Outer optical modulation amplitude, for TDECQ < 0.9 dB	OMA_{outer}	**-0.3**		**4.2**	dBm	
Outer optical modulation amplitude, for 0.9 dB < TDECQ < 3.4 dB	OMA_{outer}	**-1.2 + max (TECQ, TDECQ)**		**4.2**	dBm	
Transmitter and dispersion eye closure for PAM4	TDECQ			**3.4**	dB	
Transmitter eye closure for PAM4	TECQ			**3.4**	dB	
| TDECQ - TECQ |				**2.5**	dB	
Transmitter overshoot and undershoot				**22**	%	
Transmitter power excursion				**2.3**	dB	
Extinction ratio	ER	**3.5**			dB	
Transmitter transition time				**8**	ps	
Average launch power of OFF transmitter				**-15**	dBm	
$RIN_{21.4}OMA$				**-139**	dB/Hz	
Optical return loss tolerance				**21.4**	dB	
Transmitter reflectance				**-26**	dB	2

Optical characteristics (continued)

PARAMETER	SYMBOL	MIN	TYP	MAX	UNIT	NOTES
Receiver (per lane)						
Signaling speed per lane		**106.25 -50 ppm**	**106.25**	**106.25 +50 ppm**	GBd	
Modulation format			**PAM4**			
Lane wavelength		**1304.5**	**-**	**1317.5**	nm	
Damage threshold, each lane		**5**			dBm	
Average receive power, each lane		**-6.3**		**4**	dBm	3
Receive power (OMA_{outer}), each lane				**4.2**	dBm	
Receiver sensitivity (OMA_{outer}), for TECQ < 0.9 dB				**-3.4**	dBm	
Receiver sensitivity (OMA_{outer}), for 0.9 dB ≤ TECQ ≤ 3.4 dB				**-4.3 + TECQ**	dBm	
Receiver reflectance				**-26**	dB	
Stressed receiver sensitivity (OMA_{outer})				**-0.9**	dBm	
Conditions of the stressed receiver sensitivity test (note 4)						
Stressed eye closure for PAM4 (SECQ), lane under test			**3.4**		dB	
OMA_{outer} of each aggressor lane			**4.2**		dBm	

1. An average launch power of -3.3 dBm corresponds to an OMA of -0.3 dBm with an infinite extinction ratio.
2. Transmitter reflectance is defined by looking into the transmitter.
3. Average receive power, each lane (min) is 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.
4. These test conditions are for measuring stressed receiver sensitivity. They are not characteristics of the receiver.

Electrical characteristics

The following electrical characteristics are defined over the recommended operating conditions unless otherwise specified.

PARAMETER	SYMBOL	MIN	TYP	MAX	UNIT	NOTES
Supply voltage	V_{CC}	**3.135**		**3.465**	V	
Power consumption	PC			**16**	W	
Module input						
Single-ended voltage tolerance		**-0.4**		**1.4**	V	TP1a
DC common-mode voltage tolerance		**0.15**		**1.05**	V	TP1a
Peak-to-peak AC common-mode voltage tolerance, low-frequency	V_{CMLF}	**32**			mV	TP1a
Peak-to-peak AC common-mode voltage tolerance, full-band	V_{CMFB}	**80**			mV	TP1a
Differential-mode to common-mode return loss	RL_{cd}	See IEEE Std 802.3dj™/D2.0 Equation (179-27)			dB	TP1a
Effective return loss	ERL	**8.5**			dB	TP1
Amplitude tolerance				**0.5**	V	TP1a
Interference tolerance		See IEEE Std 802.3dj™/D2.0 Table 176D-10				TP1a
Jitter tolerance		See IEEE Std 802.3dj™/D2.0 Table 176D-11				TP1a
Module output						
Differential peak-to-peak output voltage, range that host can request		**300**		**700**	mV	TP4
Differential peak-to-peak output voltage, initial range		**300**		**600**	mV	TP4
DC common-mode voltage		**0.35**		**2.85**	V	TP4
Common-mode to common-mode return loss				**-2**	dB	TP4
Common-mode to differential-mode return loss (min)		See OIF 2024.522.02 Equation (29-2)			dB	TP4
Effective return loss	ERL	**9**			dB	TP4
Voltage modulation amplitude	VMA	**0.25**		**0.5**	V	TP4
Electrical eye closure quaternary	EECQ			**8**	dB	TP4
Low-speed signals - SCL and SDA (I_{OLmax} = 3 mA)						
Output low voltage	V_{OL}	**0**		**0.4**	V	
Output high voltage	V_{OH}	**V_{CC} - 0.5**		**V_{CC} + 0.3**	V	
Input low voltage	V_{IL}	**-0.3**		**V_{CC} × 0.3**	V	
Input high voltage	V_{IH}	**V_{CC} × 0.7**		**V_{CC} + 0.5**	V	

Pin assignment

The electrical interface of the OSFP module consists of a 60-contact edge connector, as illustrated in the figure below, which is defined in Clause 8.1 of the OSFP MSA Specification.

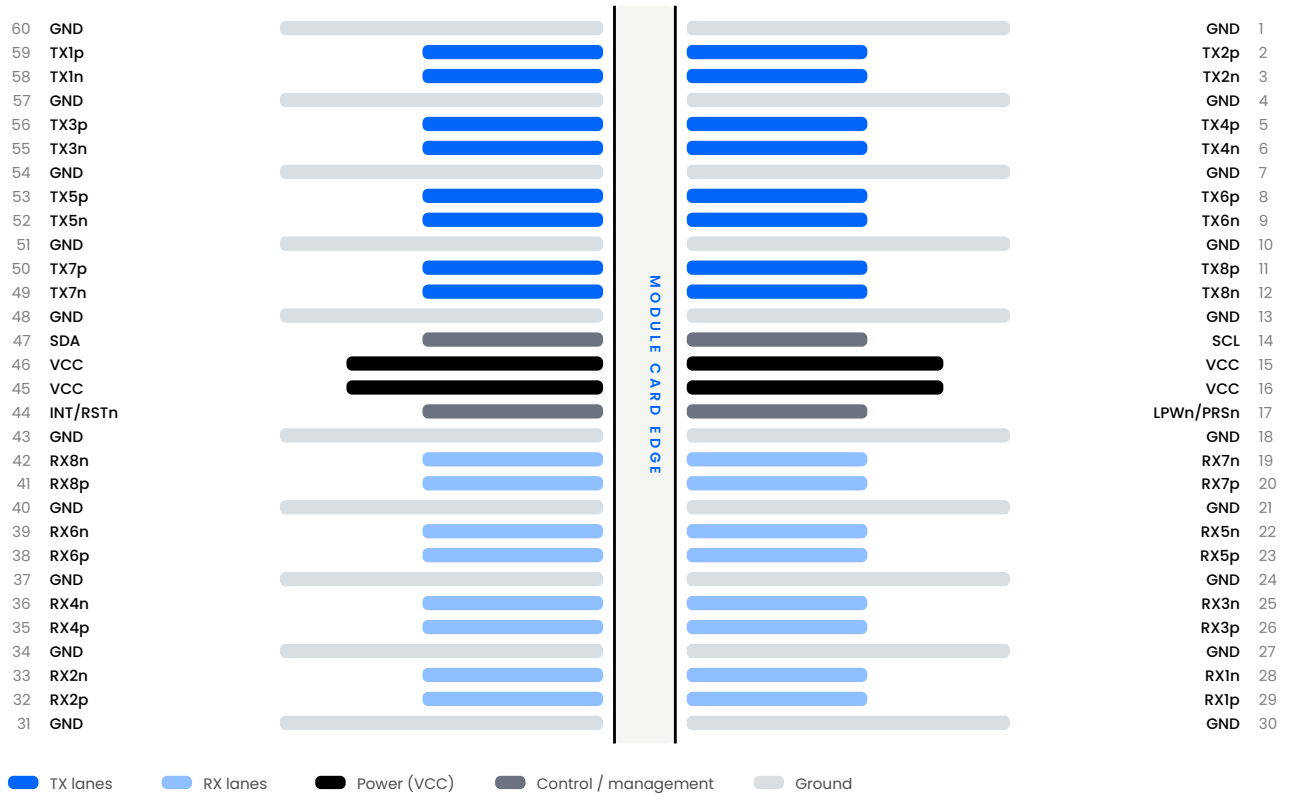


Figure 1. OSFP module pinout

SIGNALS

Pin description

NAME	PIN	DIRECTION	DESCRIPTION
TX[8:1]p / TX[8:1]n		Input	Transmit differential pairs from host to module.
RX[8:1]p / RX[8:1]n		Output	Receive differential pairs from module to host.
SCL	14	Bidirectional	2-wire serial clock signal. Requires pull-up resistor to 3.3 V on host.
SDA	47	Bidirectional	2-wire serial data signal. Requires pull-up resistor to 3.3 V on host.
LPWn/PRSn	17	Bidirectional	Multi-level signal for low-power control from host to module and module-presence indication from module to host.
INT/RSTn	44	Bidirectional	Multi-level signal for interrupt request from module to host and reset control from host to module.
VCC	15, 16, 45, 46	Power	3.3 V power for module.
GND		Ground	Module ground. Logic and power return path.

ARCHITECTURE

Functional block diagram

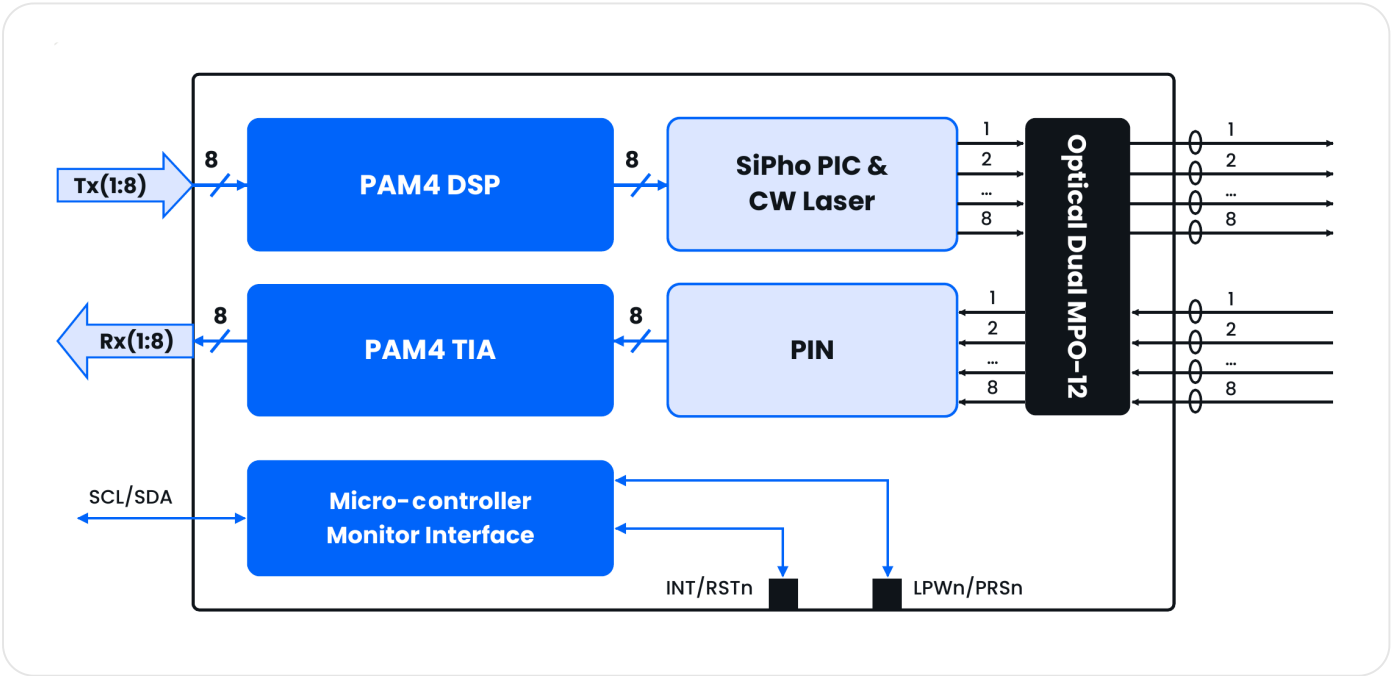


Figure 2. 1600G OSFP 2xDR4 LRO functional block diagram

COMPLIANCE

Regulatory and compliance

CATEGORY	STANDARD
EMC - immunity	EN 55035:2017+A11:2020 IEC 61000-4-3:2020
EMC - emission	FCC 47 CFR Part 15, Class B EN 55032:2015+A11:2020+A1:2020
ESD threshold	IEC EN 61000-4-2:2008
Product safety	CB: IEC 62368-1:2018 TÜV Mark: EN IEC 62368-1:2020+A11 UL Recognized Component: UL 62368-1:2019 R10.21, CSA C22.2 No. 62368-1:19
Optical safety	Class 1 laser product FDA/CDRH IEC 60825-1:2014 IEC 60825-2:2021 EN 60825-1:2014+A11
RoHS	Complies with RoHS II Directive 2011/65/EU

MECHANICAL

Mechanical package outline

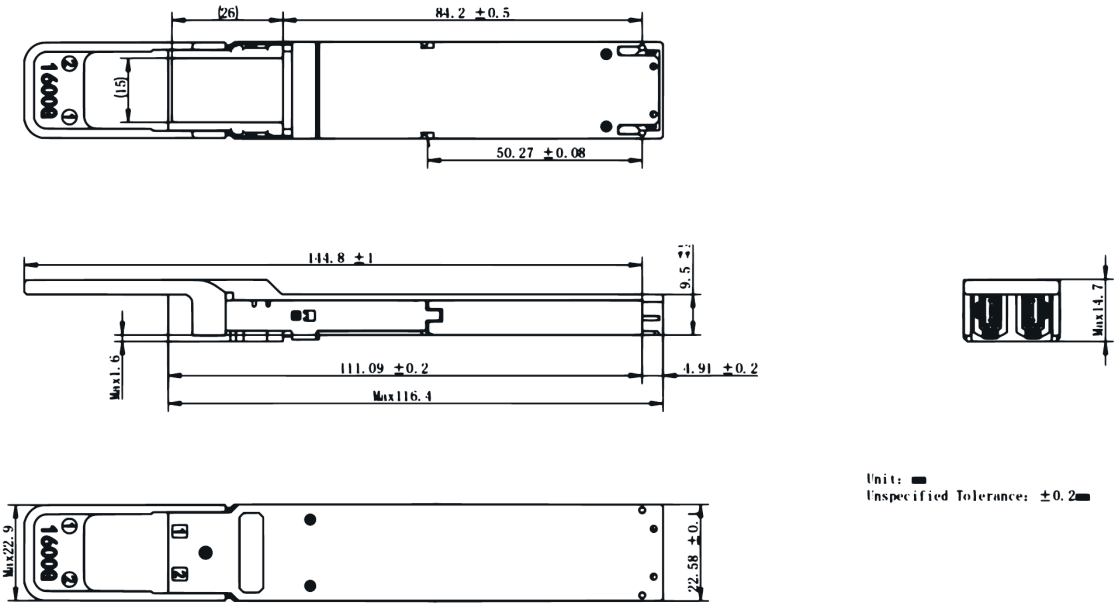


Figure 3. Mechanical package outline (all dimensions are in mm) · Unit: mm. Unspecified tolerance: ±0.2 mm.

Optical interface

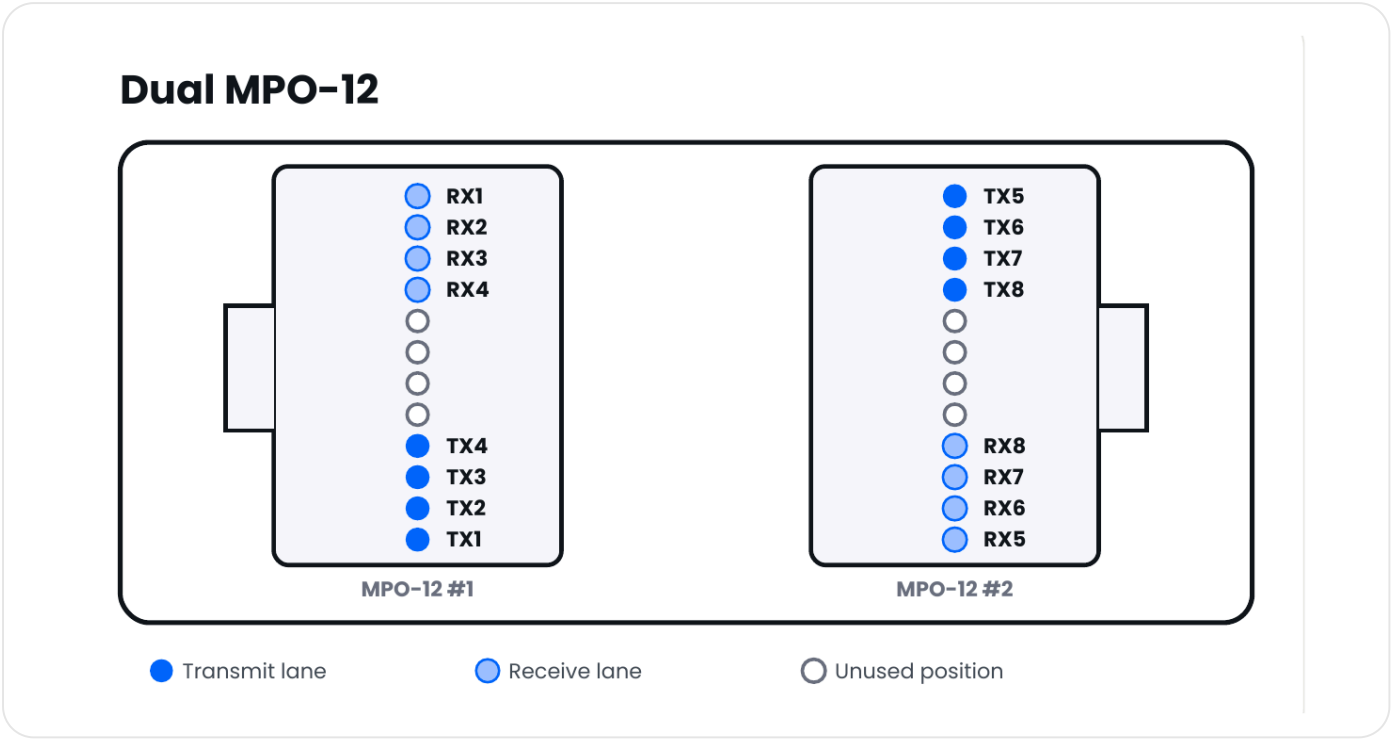


Figure 4. Optical receptacle and channel orientation for dual MPO-12 connector.
Note: optical interface is 8° APC dual MPO-12.