DRIVENETS

DATASHEET

OPTICAL TRANSCEIVER · OSFP224 RIDING HEAT SINK

DriveNets 1.6T DR8

OSFP224 transceiver with an MPO-16 interface and riding heat sink, delivering 8 × 212.5 Gbps PAM4 over single-mode fiber for 1.6TbE, InfiniBand XDR and AI cluster interconnect.

1.6 Tbps

AGGREGATE LINE RATE

8 × 212.5G PAM4

MPO-16 · 500 m

26 W maximum



OVERVIEW

The DriveNets 1.6T OSFP224 DR8 is a small-form-factor, hot-pluggable optical transceiver designed to transmit and receive serial optical data links up to 212.5 Gbps data rate per channel using PAM4 modulation over single-mode fiber. Eight 106.25 GBd host electrical lanes map onto eight optical lanes presented on an MPO-16 interface with an 8° APC endface, giving 1.6 Tbps of aggregate capacity at reaches up to 500 m with a 6.7 dB link power budget. The module integrates a high-performance silicon-photonics modulator, a PAM4 DSP and a riding heat sink (RHS) in an OSFP224 form factor, and is compliant with 1600G Ethernet specifications - IEEE P802.3dj D3.0 - the OSFP MSA rev 5.2 and OIF-CMIS 5.3 management. Maximum power consumption is 26 W across a 0 °C to +70 °C case-temperature range, for AI cluster interconnection, 1600GBASE-DR8 Ethernet links, IB XDR InfiniBand links, datacenters and other 1.6T interconnect.

Optical interface

MPO-16, 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

2-wire serial (SCL / SDA) · OIF-CMIS 5.3 memory map

IEEE P802.3dj D3.0 host electrical compliance

Power & environmental

26 W maximum power consumption · 3.3 V supply

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	**DNOT00014**
Form factor	**OSFP224, riding heat sink**
Optical interface	**MPO-16, 8° APC**
Data rate	**1.6T (8 × 212.5 Gbps PAM4)**
Reach	**500 m single-mode fiber**

Optical - link budget

Power budget (max TDECQ)	**6.7 dB**
Operating distance	**500 m**
Channel insertion loss	**3 dB**
Allocation for penalties	**3.7 dB**
Max discrete reflectance	**-35 dB**

Optical - transmitter

Modulation format	**PAM4**
Lane wavelength	**1304.5 - 1317.5 nm**
Output power (PAVG)	**-3.1 to 4 dBm**
TDECQ / TECQ, max	**3.4 dB**
Side-mode suppression	**30 dB min**
Extinction ratio	**3.5 dB min**

Optical - receiver

Average receive power	**-6.1 to 4 dBm**
Sensitivity (OMAouter)	**-3.4 dBm**
Stressed sensitivity	**-0.9 dBm**
Damage threshold	**5 dBm per lane**
Receiver reflectance	**-26 dB max**

Electrical

Supply voltage (VCC)	**3.135 - 3.465 V**
Baud rate per lane	**106.25 GBd ±50 ppm**
Power consumption	**26 W maximum**
Output voltage, enabled	**1000 mVpp max**
Effective return loss	**8.5 dB min (TP1 / TP4)**

Environmental

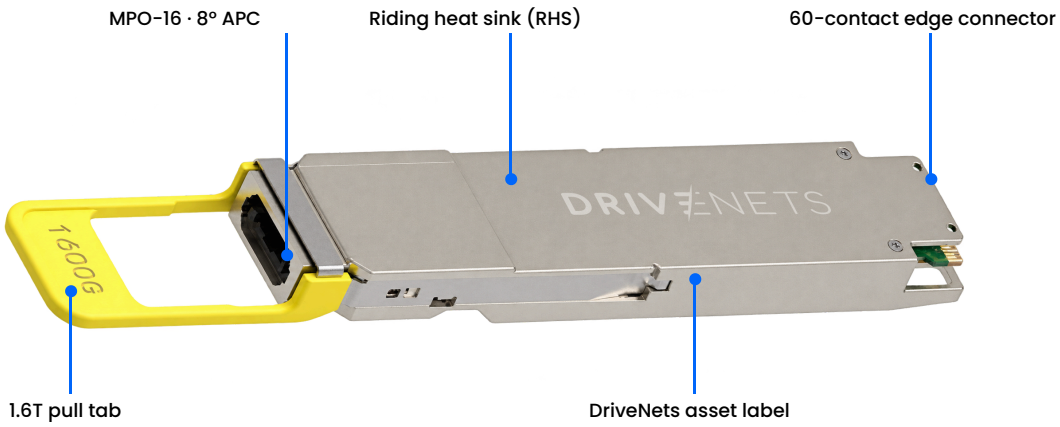
Operating case temp	**0 °C - +70 °C**
Storage temperature	**-40 °C - +85 °C**
Relative humidity	**5% - 85%**
VCC absolute maximum	**-0.3 V - +3.6 V**
Cooling	**Riding heat sink (RHS)**

Management

Host interface	**60-contact edge connector**
Memory map	**OIF-CMIS 5.3**

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

26 W
MAXIMUM POWER

APPLICATIONS & STANDARDS

Applications

- AI cluster interconnection
- 1600GBASE-DR8 Ethernet links
- IB XDR InfiniBand links
- 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™-D3.0

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. Absolute maximum ratings: modules operated outside this range may be permanently damaged.

OPERATING CONDITIONS

Recommended operating conditions

PARAMETER	SYMBOL	MIN	TYPICAL	MAX	UNIT
Operating case temperature	T_C	**0**	**-**	**70**	°C
Power supply voltage	V_{CC}	**3.135**	**3.3**	**3.465**	V
Baud rate, per channel	BR	**106.25 -50 ppm**	**106.25**	**106.25 +50 ppm**	GBd

1. Recommended operating conditions: performance is not guaranteed outside this range.

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), rev 5.3.

Optical characteristics

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

PARAMETER	SYMBOL	MIN	TYP	MAX	UNIT	NOTE
Link power budgets						
Power budget (for max TDECQ)				**6.7**	dB	
Operating distance				**500**	m	
Channel insertion loss				**3**	dB	
Maximum discrete reflectance				**-35**	dB	
Allocation for penalties (for max TDECQ)				**3.7**	dB	
Additional insertion loss allowed				**0**	dB	
Transmitter (per lane)						
Signaling speed		**106.25 -50 ppm**	**106.25**	**106.25 +50 ppm**	GBd	
Modulation format	MF		**PAM4**			
Lane wavelength		**1304.5**	**-**	**1317.5**	nm	
Side-mode suppression ratio	SMSR	**30**			dB	
Average launch power, each lane	P_{AVG}	**-3.1**		**4**	dBm	1, 2
Outer optical modulation amplitude, for TDECQ < 0.9 dB	OMA_{outer}	**-0.1**		**4.2**	dBm	
Outer optical modulation amplitude, for 0.9 dB < TDECQ < 3.4 dB	OMA_{outer}	**-1.0 + 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	
$TDECQ_{CER}$, each lane				**4.4**	dB	
Transmitter functional symbol error histogram, each lane (max)		See IEEE Std 802.3dj™ D3.0, Table 180-18			-	

PARAMETER	SYMBOL	MIN	TYP	MAX	UNIT	NOTE
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	3
Receiver (per lane)						
Signaling speed per lane		**106.25 -50 ppm**	**106.25**	**106.25 +50 ppm**	GBd	
Modulation format	MF		**PAM4**			
Lane wavelength		**1304.5**	**-**	**1317.5**	nm	
Damage threshold, each lane		**5**			dBm	
Average receive power, each lane		**-6.1**		**4**	dBm	4
Receive power (OMA_{outer}), each lane				**4.2**	dBm	
Receiver sensitivity (OMA_{outer}), for TECQ < 0.9 dB				**-3.4**	dBm	5
Receiver sensitivity (OMA_{outer}), for 0.9 dB ≤ TECQ ≤ 3.4 dB				**-4.3 + TECQ**	dBm	5
Receiver reflectance	RR			**-26**	dB	
Stressed receiver sensitivity (OMA_{outer})	SRS			**-0.9**	dBm	5
Conditions of the stressed receiver sensitivity test (note 6)						
Stressed eye closure for PAM4 (SECQ), lane under test			**3.4**		dB	
OMA_{outer} of each aggressor lane			**4.2**		dBm	7

1. Average launch power, each lane (min) is 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. An average launch power of -3.1 dBm corresponds to an OMA of -0.1 dBm with an infinite extinction ratio.
3. Transmitter reflectance is defined looking into the transmitter.
4. 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.
5. Measured with conformance test signal at TP3 (see 180.8) for the BLER specified in 180.2.
6. These test conditions are for measuring stressed receiver sensitivity. They are not characteristics of the receiver.
7. No aggressors needed for 200GBASE-DR1 in a single lane device.

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			**26**	W	
Module input						
DC common-mode voltage tolerance		**0.15**		**1.05**	V	TP1
Peak-to-peak AC common-mode voltage tolerance, low-frequency	V_{CMLF}	**32**			mV	TP1
Peak-to-peak AC common-mode voltage tolerance, full-band	V_{CMFB}	**85**			mV	TP1
Differential-mode to common-mode return loss	RL_{cd}	See IEEE Std 802.3dj™ D3.0, Equation (179-23)			dB	TP1
Effective return loss	ERL	**8.5**			dB	TP1
Amplitude tolerance				**0.5**	V	TP1
Interference tolerance		See IEEE Std 802.3dj™ D3.0, Table 176D-11				TP1
Jitter tolerance		See IEEE Std 802.3dj™ D3.0, Table 176D-12				TP1
Module output						
Differential peak-to-peak output voltage, output disabled				**30**	mV	TP4
Differential peak-to-peak output voltage, output enabled				**1000**	mV	TP4
Peak-to-peak AC common-mode voltage, low-frequency	V_{CMLF}			**15**	mV	TP4
Peak-to-peak AC common-mode voltage, full-band	V_{CMFB}			**60**	mV	TP4
DC common-mode voltage		**0.15**		**1.05**	V	TP4
Common-mode to common-mode return loss		See IEEE Std 802.3dj™ D3.0, Equation (179-15)			dB	TP4
Common-mode to differential-mode return loss		See IEEE Std 802.3dj™ D3.0, Equation (179-16)			dB	TP4
Effective return loss	ERL	**8.5**			dB	TP4
Transmitter steady-state voltage		**0.389**		**0.5**	V	TP4
Linear fit pulse peak ratio		**0.46**			-	TP4
Level separation mismatch ratio		**0.95**			-	TP4

PARAMETER	SYMBOL	MIN	TYP	MAX	UNIT	NOTES
Transmitter output waveform: absolute value of step size for all taps		**0.005**		**0.025**	-	
Transmitter output waveform: value at minimum state for c(-3)				**-0.06**	-	
Transmitter output waveform: value at maximum state for c(-2)		**0.12**			-	
Transmitter output waveform: value at minimum state for c(-1)				**-0.34**	-	
Transmitter output waveform: value at minimum state for c(0)				**0.5**	-	
Transmitter output waveform: value at minimum state for c(1)				**-0.2**	-	
Signal-to-noise-and-distortion ratio (SNDR)		See IEEE Std 802.3dj™ D3.0, Table 179-9			dB	TP4
Signal-to-residual-intersymbol-interference ratio		**28**			dB	TP4
Output jitter (J_{RMS03})				**0.023**	UI	TP4
Output jitter (EOJ_{03})				**0.025**	UI	TP4
Output jitter (J_{4u03})				**0.118**	UI	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.

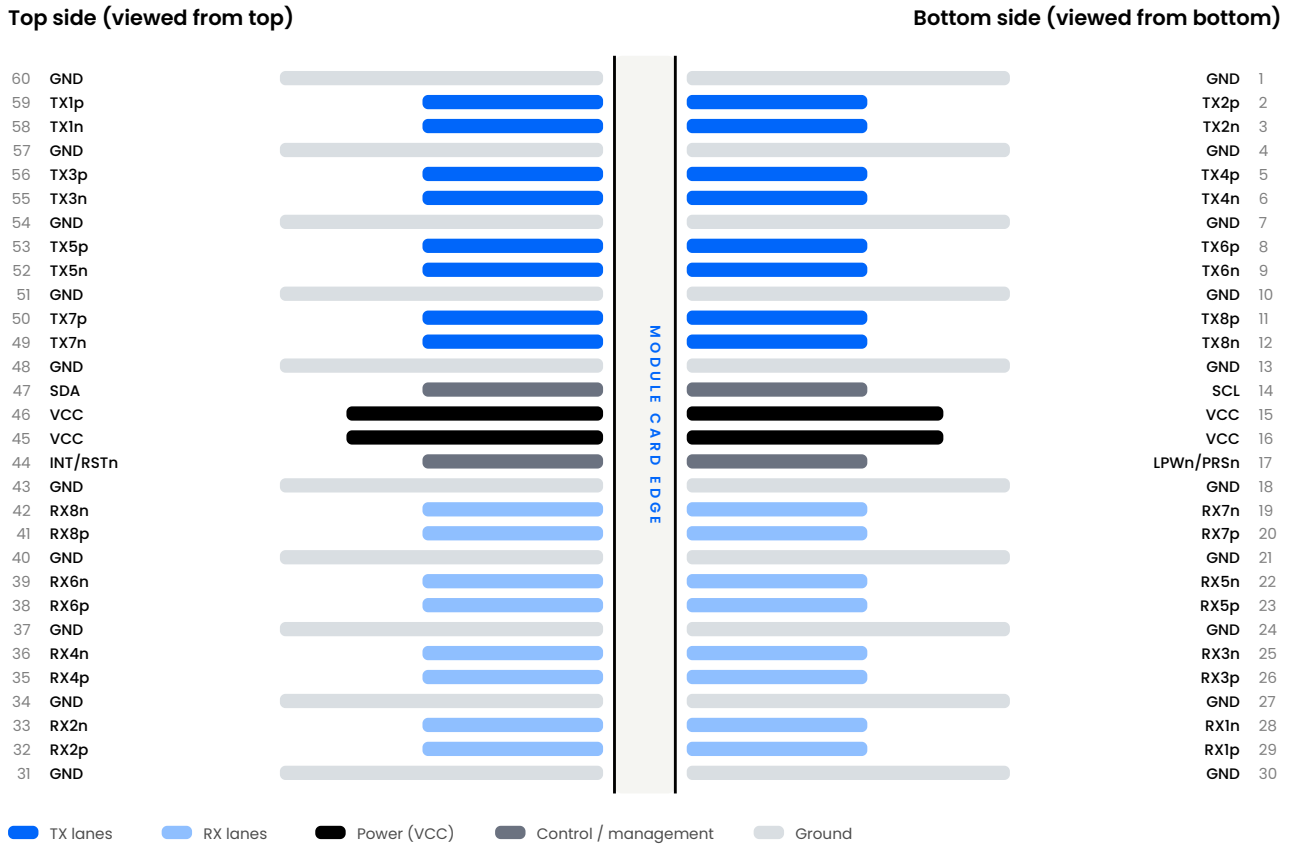


Figure 1. OSFP module pinout

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

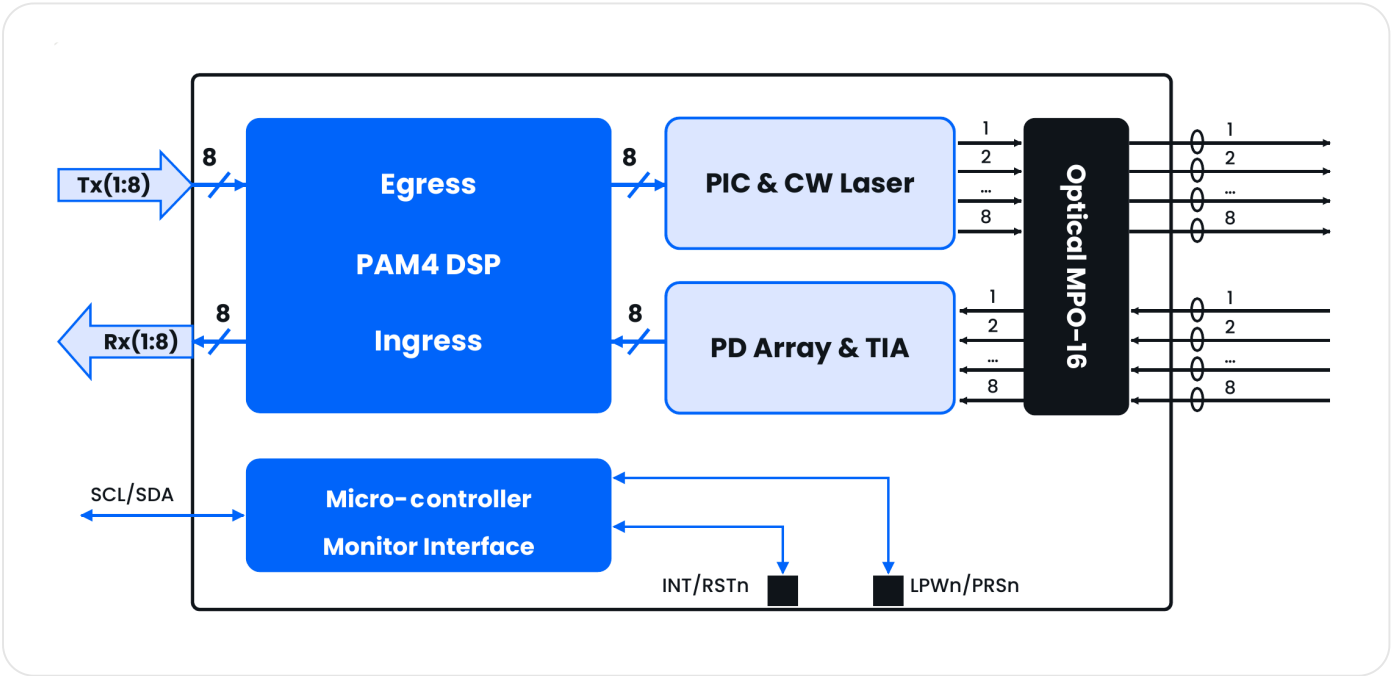


Figure 2. 1600G OSFP DR8 functional block diagram

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

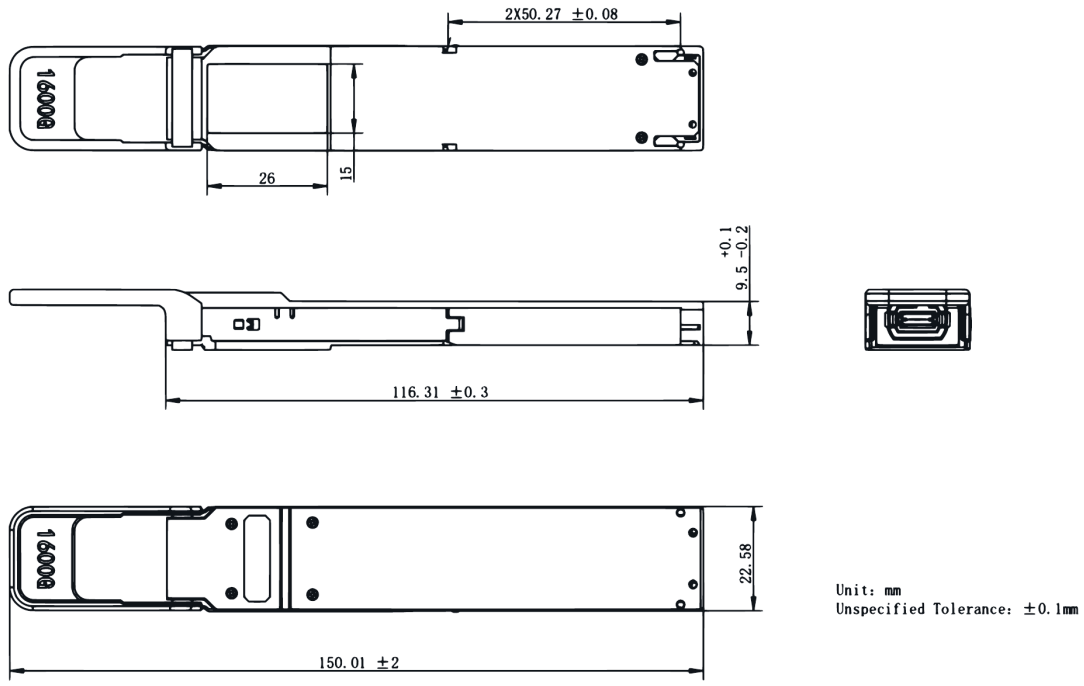
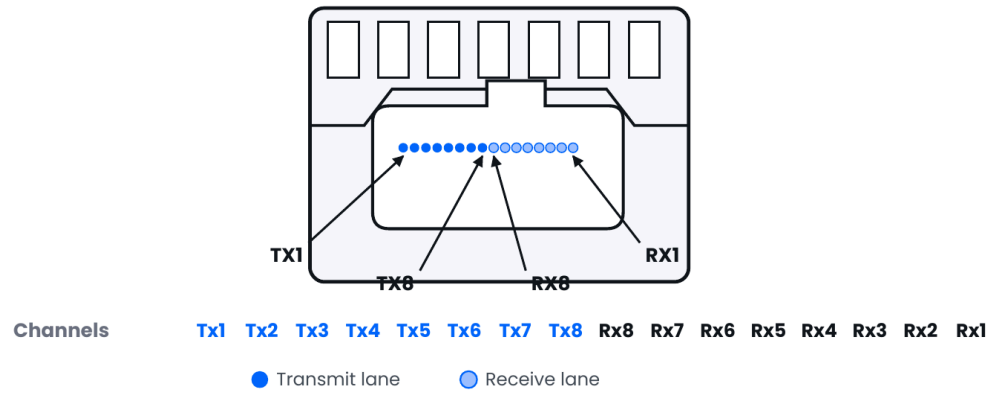


Figure 3. Mechanical package outline (all dimensions are in mm) · Unit: mm. Unspecified tolerance: ±0.1 mm.

Optical interface



Channels	Tx1	Tx2	Tx3	Tx4	Tx5	Tx6	Tx7	Tx8	Rx8	Rx7	Rx6	Rx5	Rx4	Rx3	Rx2	Rx1

Transmit lane Receive lane

Figure 4. Optical receptacle and channel orientation for MPO-16 connector.
Note: optical interface is 8° APC MPO-16.