

## 100Gb/s QSFP28 LAN-WDM 80km Transceiver

### OPL-QSFP28-ZR-80

#### Features

- Support 100GBASE-ZR4
- Lane bit rate 25.78 Gb/s 100GE, 27.95 Gb/s OTU4;
- Up to 80km transmission on SMF;
- LAN WDM EML laser and PIN receiver with SOA;
- High speed I/O electrical interface (CAUI-4);
- I2C interface with integrated Digital Diagnostic monitoring;
- QSFP28 MSA package with duplex LC connector;
- Single +3.3V power supply;
- Maximum power consumption 6.5 W;
- Operating case temperature: 0 to +70 °C;
- Compliant to IEEE 802.3bm and ITU-T G.959
- Compliant to SFF-8665 and SFF-8679;

#### Application

- 100GBASE-ZR4 Ethernet Links
- 100G Telecom connections

#### Absolute Maximum Ratings

Parameter	Symbol	Min.	Type	Max.	Unit	Note
Supply Voltage	$V_{cc}$	-0.5	-	4.0	V	
Storage Temperature	$T_S$	-40	-	85	°C	
Operating Humidity	RH	-	-	85	%	

#### Recommended Operating Conditions

Parameter	Symbol	Min.	Type	Max.	Unit	Note
Operating Case Temperature	$T_c$	0		70	°C	
Supply Voltage	$V_{cc}$	3.14	3.3	3.47	V	
Supply Current	$I_{cc}$	-	-	1.96	A	
Power Dissipation	$P_d$	-	-	6.5	W	
Aggregate Bit Rate	$BR_{AVE}$	-	103.125	111.808	Gb/s	
Bit Rate per Lane	$BR_{LANE}$	-	25.78	27.952	Gbps	

Parameter	Symbol	Min.	Type	Max.	Unit	Note
Transmission Distance	TD		-	80	Km	Over SMF

## Electrical Characteristics

Parameter	Symbol	Min.	Typ.	Max.	Units	Notes
Transmitter (Module Input)						
Differential Data Input Amplitude	$V_{IH}$	85	-	900	mVpp	
Differential Termination Mismatch		-	-	10	%	
Differential input return loss(min)	$RLd(f)$	Compliance with IEEE802.3ba Equation (83A-5)			dB	
Differential to common mode input return loss (min)	$RLdc(f)$	Compliance with IEEE802.3ba Equation (83A-6)			dB	
LPMODE, Reset and ModSel, V in low	$V_{IL}$	-0.3	-	0.8	V	
LPMODE, Reset and ModSel, V in high	$V_{IH}$	2.0	-	$V_{CC}+0.3$	V	
Receiver (Module Output)						
Differential Data Output Amplitude	$V_{OUT, P-P}$	200	-	900	mV <sub>PP</sub>	
Differential Termination Mismatch (1MHz)		-	-	10	%	
Transition time, 20% to 80%	$T_r/T_f$	12			ps	
Differential Output return loss (min)	$Rld(f)$	Compliance with IEEE802.3ba Equation (83A-7)			dB	
Common to differential mode conversion return loss (min)	$Rldc(f)$	Compliance with IEEE802.3ba Equation (83A-8)			dB	
ModPrsl and IntL, Vout_low	$V_{OL}$	0	-	0.4	V	
ModPrsl and IntL, Vout_high	$V_{OH}$	$V_{CC}-0.5$	-	$V_{CC}+0.3$	V	

## Optical Characteristics

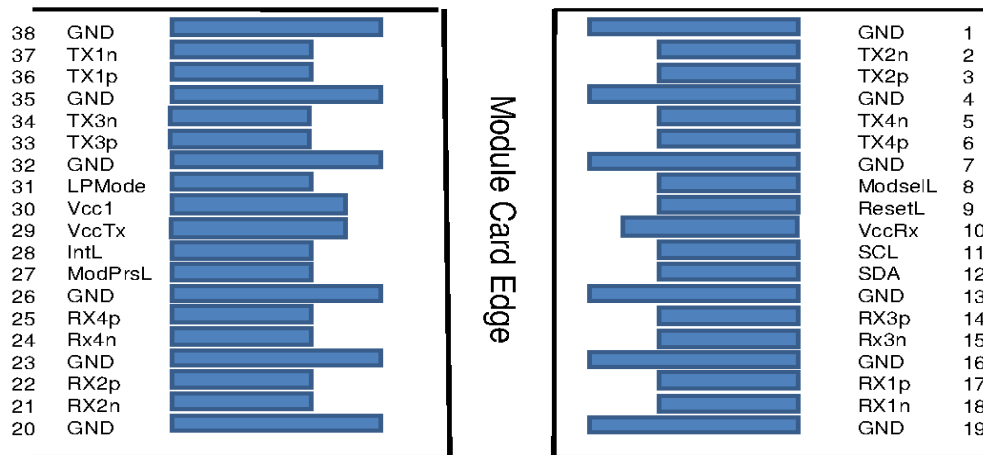
Parameter	Symbol	Min	Typical	Max	Unit	Notes
Transmitter						
Center Wavelength Lane 0	$\lambda_0$	1294.53	1295.56	1296.59	nm	
Center Wavelength Lane 1	$\lambda_1$	1299.02	1300.05	1301.09	nm	

Center Wavelength Lane 2	$\lambda_2$	1301.54	1304.58	1305.63	nm	
Center Wavelength Lane 3	$\lambda_3$	1308.09	1309.14	1310.19	nm	
Total Launch Power, 100GE	$P_{AVG}$	7	-	12.5	dBm	1
Average Launch Power per Lane, 100GE	$P_{Lane}$	1	-	6.5	dBm	1
Difference in launch power between lanes	$P_{\Delta}$	-	-	3	dB	
Average Output Power(Laser OFF)	$P_{off}$	-	-	-30	dBm	
Side Mode Suppression Ratio	SMSR	30	-	-	dB	
Extinction Ratio, 100GE & OTU4	ER	6	-	-	dB	
<b>Receiver</b>						
Center Wavelength Lane 0	$\lambda_0$	1294.53	1295.56	1296.59	nm	
Center Wavelength Lane 1	$\lambda_1$	1299.02	1300.05	1301.09	nm	
Center Wavelength Lane 2	$\lambda_2$	1301.54	1304.58	1305.63	nm	
Center Wavelength Lane 3	$\lambda_3$	1308.09	1309.14	1310.19	nm	
Damage threshold	$P_{DAM}$	-	-	5.5	dBm	
Average Rx Power per Lane, 100GE	$P_{RX\_Lane}$	-28	-	4.5	dBm	
LOS Assert	$LOS_A$	-40			dBm	
LOS De-assert	$LOS_{DA}$			-29	dBm	
LOS Hysteresis	$LOS_H$	0.5			dB	

**Note:**

1. The optical power is launched into SMF.
2. Measured with a PRBS 231-1 test pattern @25.78125 Gb/s, BER≤5E-5.

**Pin Description**



Top Side  
Viewed From Top

Bottom Side  
Viewed From Bottom

Pin	Name	Logic	Description	Notes
1	GND		Ground	1
2	Tx2n	CML-I	Transmitter Inverted Data Input	
3	Tx2p	CML-I	Transmitter Non-Inverted Data Input	
4	GND		Ground	1
5	Tx4n	CML-I	Transmitter Inverted Data Input	
6	Tx4p	CML-I	Transmitter Non-Inverted Data Input	
7	GND		Ground	1
8	ModSelL	LVTTL-I	Module Select	
9	ResetL	LVTTL-I	Module Reset	
10	Vcc Rx		+3.3V Power Supply Receiver	2
11	SCL	LVCNOS- I/O	2-wire serial interface clock	
12	SDA	LVCNOS- I/O	2-wire serial interface data	
13	GND		Ground	1
14	Rx3p	CML-O	Receiver Non-Inverted Data Output	
15	Rx3n	CML-O	Receiver Inverted Data Output	
16	GND		Ground	1
17	Rx1p	CML-O	Receiver Non-Inverted Data Output	
18	Rx1n	CML-O	Receiver Inverted Data Output	
19	GND		Ground	1
20	GND		Ground	1
21	Rx2n	CML-O	Receiver Inverted Data Output	
22	Rx2p	CML-O	Receiver Non-Inverted Data Output	
23	GND		Ground	1
24	Rx4n	CML-O	Receiver Inverted Data Output	
25	Rx4p	CML-O	Receiver Non-Inverted Data Output	
26	GND		Ground	1
27	ModPrsL	LVTTL-O	Module Present	
28	IntL/RxLOS	LVTTL-O	Interrupt/ RxLOS	
29	Vcc Tx		+3.3V Power supply transmitter	2
30	Vcc1		+3.3V Power supply	2
31	LPMMode/Txdis	LVTTL-I	Low Power Mode/ Txdis	
32	GND		Ground	1
33	Tx3p	CML-I	Transmitter Non-Inverted Data Input	
34	Tx3n	CML-I	Transmitter Inverted Data Input	
35	GND		Ground	1
36	Tx1p	CML-I	Transmitter Non-Inverted Data	
37	Tx1n	CML-I	Transmitter Inverted Data Input	
38	GND		Ground	1

**Note:**

1. GND is the symbol for signal and supply (power) common for the QSFP28 module. All are common within the QSFP28 module and all module voltages are referenced to this potential unless otherwise noted. Connect these directly to the host board signal-common ground plane.

2. Vcc Rx, Vcc1 and Vcc Tx are the receiver and transmitter power supplies and shall be applied concurrently. Requirements defined for the host side of the Host Edge Card Connector are listed in MSA. The connector pins are each rated for a maximum current of 1000 mA.

## Digital Diagnostics

Parameter	Range	Accuracy	Unit	Calibration
Temperature	0~70	±3	°C	Internal
Voltage	0~Vcc	0.1	V	Internal
Tx Bias Current Per Lane	0~100	10%	mA	Internal
Tx Output Power Per Lane	1.0~6.5	±3	dBm	Internal
Rx Power (Each Lane)	-28~4.5	±3	dBm	Internal

## Outline Drawing (mm)

