

## 100Gb/s QSFP28 XZR4 Transceiver QSFP28-100G-ZR4

### Product Features

- Compliant with QSFP28 Standard:
- SFF-8661 Rev 2.5, SFF-8636 Rev 2.10a
- Telecom networking
- Class 1 Laser
- Single 3.3V Supply Voltage
- High speed I/O electrical interface (CAUI-4) compliant with IEEE 802.3bm-2015
- 100GBASE-ZR4 103.125G 100km point-to-point Ethernet links
- Rx sensitivity of -29dBm 5E-5 with enabled KR4 FEC in host for up to 100km SMF
- Power Dissipation 4.5W at 55-[C ,6.5W at 70-[C Case Operating Temperature
- 0 °C is environment temp; 70 °C is Case Operating Temperature
- LAN WDM EML cooled laser and SOA+PIN cooled Receiver
- Universal QSFP28 MSA package with duplex LC connector
- Two Wire Serial Interface with Digital Diagnostic Monitoring
- Complies with EU Directive 2011/65/EU (RoHS compliant)
- LPMoDe, ModPrsL, ModSeLL and ResetL are supported

### Applications

- 100GBASE-XZR4 100G Ethernet
- Telecom networking

### Descriptions

QSFP28 is designed for commercial level 100km optical communication applications. This module contains 4- lane optical transmitter, 4-lane optical receiver and module management block including 2 wire serial I/O. The optical signals are multiplexed to a single-mode fiber through an industry standard LC connector. A block diagram is shown in following figure.



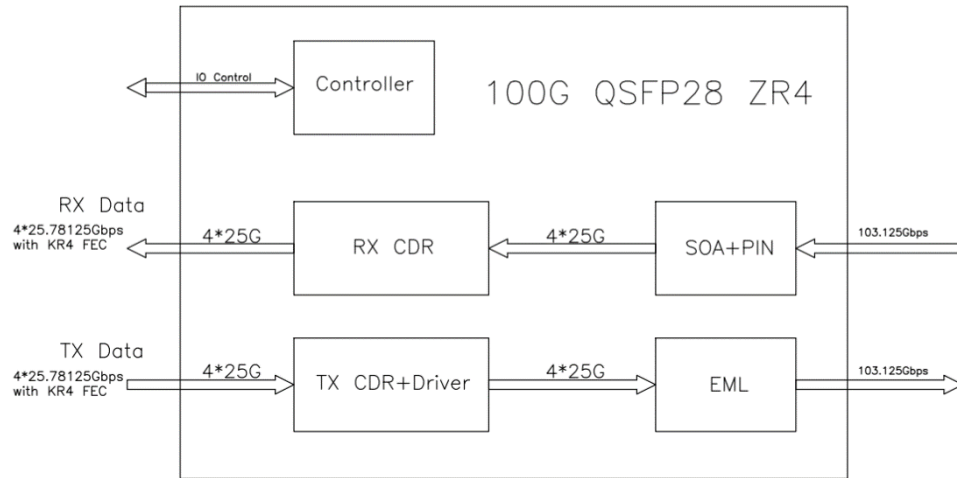


Figure 1. Transceiver Block Diagram

## Pin Descriptions

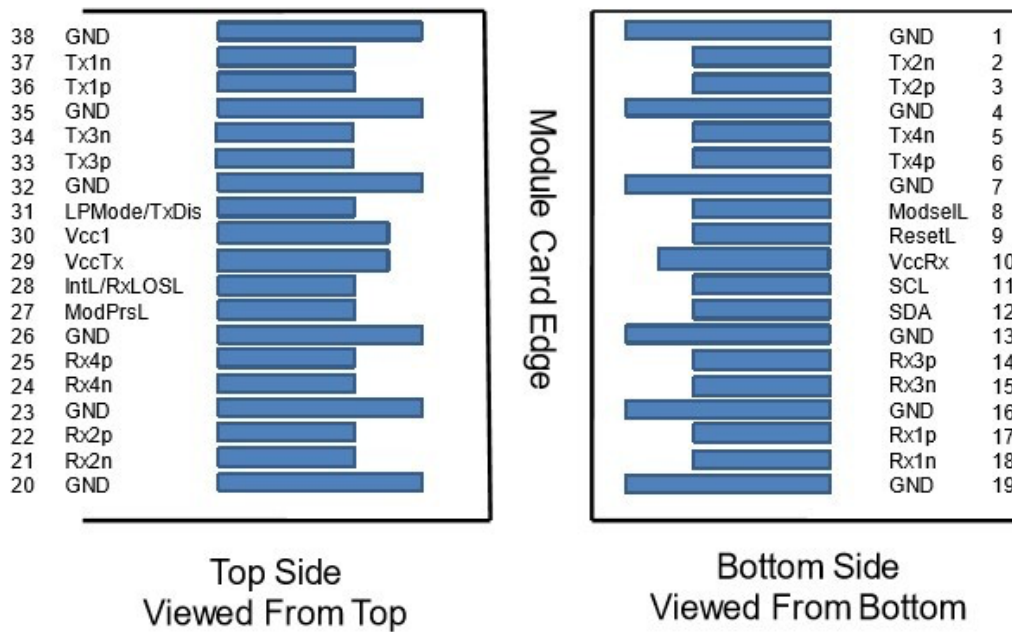


Figure 2. MSA compliant Connector

Pin	Logic	Symbol	Description	Plug Sequence	Note
1		GND	Ground	1	
2	CML-I	Tx2n	Transmitter Inverted Data Input	3	
3	CML-I	Tx2p	Transmitter Non-Inverted Data Input	3	
4		GND	Ground	1	
5	CML-I	Tx4n	Transmitter Inverted Data Input	3	

6	CML-I	Tx4p	Transmitter Non-Inverted Data Input	3	
7		GND	Ground	1	
8	LVTTL -I	ModselL	Module Select	3	
9	LVTTL -I	ResetL	Module Reset	3	
10		Vcc Rx	+3.3V Power Supply Receiver	2	
11	LVCM OS-I/O	SCL	2-wire serial interface clock	3	
12	LVCM OS-I/O	SDA	2-wire serial interface data	3	
13		GND	Ground	1	
14	CML-O	Rx3p	Receiver Non-Inverted Data Output	3	
15	CML-O	Rx3n	Receiver Inverted Data Output	3	
16		GND	Ground	1	
17	CML-O	Rx1p	Receiver Non-Inverted Data Output	3	
18	CML-O	Rx1n	Receiver Inverted Data Output	3	
19		GND	Ground	1	
20		GND	Ground	1	
21	CML-O	Rx2n	Receiver Inverted Data Output	3	
22	CML-O	Rx2p	Receiver Non-Inverted Data Output	3	
23		GND	Ground	1	
24	CML-O	Rx4n	Receiver Inverted Data Output	3	
25	CML-O	Rx4p	Receiver Non-Inverted Data Output	3	
26		GND	Ground	1	
27	LVTTL -O	ModPrsL	Module Present	3	
28	LVTTL -O	IntL/RxL O S L	Interrupt. Optionally configurable as RxLOSL via the management interface (SFF-8636). Interrupt. Optionally configurable as RxLOSL via the management interface (SFF-8636).	3	
29		Vcc Tx	+3.3V Power supply transmitter	2	
30		Vcc1	+3.3V Power supply	2	
31	LVTTL -I	LPMode/ TxD is	Low Power Mode. Optionally configurable as TxDis via the management interface (SFF-8636).	3	
32		GND	Ground	1	
33	CML-I	Tx3p	Transmitter Non-Inverted Data Input	3	
34	CML-I	Tx3n	Transmitter Inverted Data Input	3	
35		GND	Ground	1	
36	CML-I	Tx1p	Transmitter Non-Inverted Data Input	3	
37	CML-I	Tx1n	Transmitter Inverted Data Input	3	
38		GND	Ground	1	

Note: 1. Circuit ground is internally isolated from chassis ground.

## Absolute Maximum Ratings

It has to be noted that the operation in excess of any individual absolute maximum ratings might cause permanent damage to this module.

Parameter	Symbol	Min.	Max.	Unit	Notes
Storage Temperature	TS	-40	85	°C	
Supply Voltage	VCC	0	3.6	V	
Relative Humidity (non-condensing)	RH	5	85	%	
Data Input Voltage Differential	IVDIP-VDINI	-	1	V	

Note: 1. Non-condensing

## Operating Environments

Electrical and optical characteristics below are defined under this operating environment, unless otherwise specified.

Parameter	Symbol	Min.	Typical	Max.	Unit	Notes
Operating Temperature	T <sub>OPR</sub>	0	-	70	°C	1
Power Supply Voltage	VCC	3.1	3.3	3.47	V	
Maximum Power Dissipation	PD	-	4.5	7.5	W	2
Aggregate Bit Rate	ABR	-	103.125	-	Gb/s	
Data Rate per Lane	DRL	-	25.78	-	Gb/s	
Link Distance with G.652		40	80		km	
Two Wire Serial Interface Clock Rate	-	-	-	400	kHz	

1. 0°C is operating environment temperature, +70°C is case temperature

2. Power dissipation 4.5W at 55 °C ,6.5W at 70 °C Case Operating Temperature

## Electrical Characteristics

**High-Speed Signal:** Compliant to IEEE802.3 CAUI-4 C2M

**Low-Speed Signal:** Compliant to SFF-8679

Parameter	Symbol	Min.	Typical	Max.	Unit	Notes
Power Dissipation			4.5	7.5	W	
Supply Current	I <sub>CC</sub>		1.4	2.3	A	
<b>Receiver (Module Output)</b>						
Parameter	Symbol	Min.	Typical	Max.	Unit	Notes
Differential Data Input Amplitude	V <sub>IN,P-P</sub>	-	-	900	mV	
Differential Termination Mismatch		-	-	10	%	
Output Rise/Fall Time, 20%~80%	T <sub>R</sub>	12	-	-	ps	
LPMode, Reset and ModSelL	V <sub>IL</sub>	-0.3	-	0.8	V	
	V <sub>IH</sub>	2	-	V <sub>CC+</sub> 0.3	V	

### Transmitter (Module Input)

Parameter	Symbol	Min.	Typical	Max.	Unit	Notes
Differential Data Output Amplitude	V <sub>OUT,P-P</sub>	-	-	900	mV	
Differential Termination Mismatch		-	-	10	%	
Output Rise/Fall Time, 20%~80%	TR	12	-	-	ps	

## Optical Characteristics

### Transmitter Optical Specifications

Parameter	Symbol	Min.	Typical	Max.	Unit	
Wavelength L0	$\lambda_{C0}$	1294.53	1295.56	1296.59	nm	
Wavelength L1	$\lambda_{C1}$	1299.02	1300.05	1301.09	nm	
Wavelength L2	$\lambda_{C2}$	1303.54	1304.58	1305.63	nm	
Wavelength L3	$\lambda_{C3}$	1308.09	1309.14	1310.19	nm	
Side-mode suppression ratio	SMSR	30			dB	
Total Average Optical Launch Power	POUT	-	-	12.5	dBm	
Average Launch Power Tx_Off (Each Lane)	POUT_OFF	-	-	-30	dBm	
Average Optical Launch Power (Each Lane)	POUTL	3	-	6.5	dBm	
Extinction Ratio	ER	8	-	-	dB	
Spectral Width	$\Delta\lambda$	-	-	1	nm	
Optical Modulation Amplitude (Each Lane)	OMA	0	-	6.5	dBm	
Launch Power in OMA minus TDP (Each Lane)	OMA-TDP	0	-	-	dBm	
Difference in launch power between any two lanes (OMA)	DT_OMA	-	-	2.5	dB	
Optical Return Loss Tolerance	ORLT	-	-	20	dB	
RIN <sub>20OMA</sub>	RIN	-	-	-130	dB/HZ	
Transmitter Reflectance	TR	-	-	-12	dB	
Transmitter Eye Mask Definition	-	IEEE 802.3bs-2010 {0.25, 0.4, 0.45, 0.25, 0.28, 0.4}				

## Receiver Optical Specifications

Parameter	Symbol	Min.	Typical	Max.	Unit	Notes
Wavelength L0	$\lambda C0$	1294.53	1295.56	1296.59	nm	
Wavelength L1	$\lambda C1$	1299.02	1300.05	1301.09	nm	
Wavelength L2	$\lambda C2$	1303.54	1304.58	1305.63	nm	
Wavelength L3	$\lambda C3$	1308.09	1309.14	1310.19	nm	
Receiver Sensitivity (OMA) per Lane				-29	dBm	1
Stressed Receiver Sensitivity in OMA (Each Lane)	-	-	-	-27	dBm	1
Saturation Power, each lane	SP	-4.5			dBm	
Damage Threshold for Receiver	Pin, damage	0	-	-	dBm	
Average Receive Power (Each Lane)	-	-32	-	-4.5	dBm	
Receive Power in OMA (Each Lane), Overload	OMA	-	-	-4.5	dBm	
LOS Assert	LOSA	-40	-	-	dBm	
LOS De-assert	LOSD	-	-	-30	dBm	
LOS hysteresis	LOSH	0.5	-	-	dB	

1. Sensitivity is measured @ BER5E-5

## Digital Diagnostic Monitoring Functions

QSFP28-100G-XZR4 support the I2C-based Diagnostic Monitoring Interface (DMI) defined in document SFF8636. The host can access real-time performance of transmitter and receiver optical power, temperature, supply voltage and bias current.

Parameter	Range	Accuracy	Unit	Calibration
Temperature	-40 to 85	$\pm 3$	$^{\circ}\text{C}$	Internal
Voltage	0 to VCC	$\pm 3\%$	V	Internal
Tx Bias Current (Each Lane)	0 to 100	10%	mA	Internal
Tx Output Power (Each Lane)	2 to +6.5	$\pm 3$	dB	Internal
Rx Receive Power (Each Lane)	-28 to -5	$\pm 3$	dB	Internal

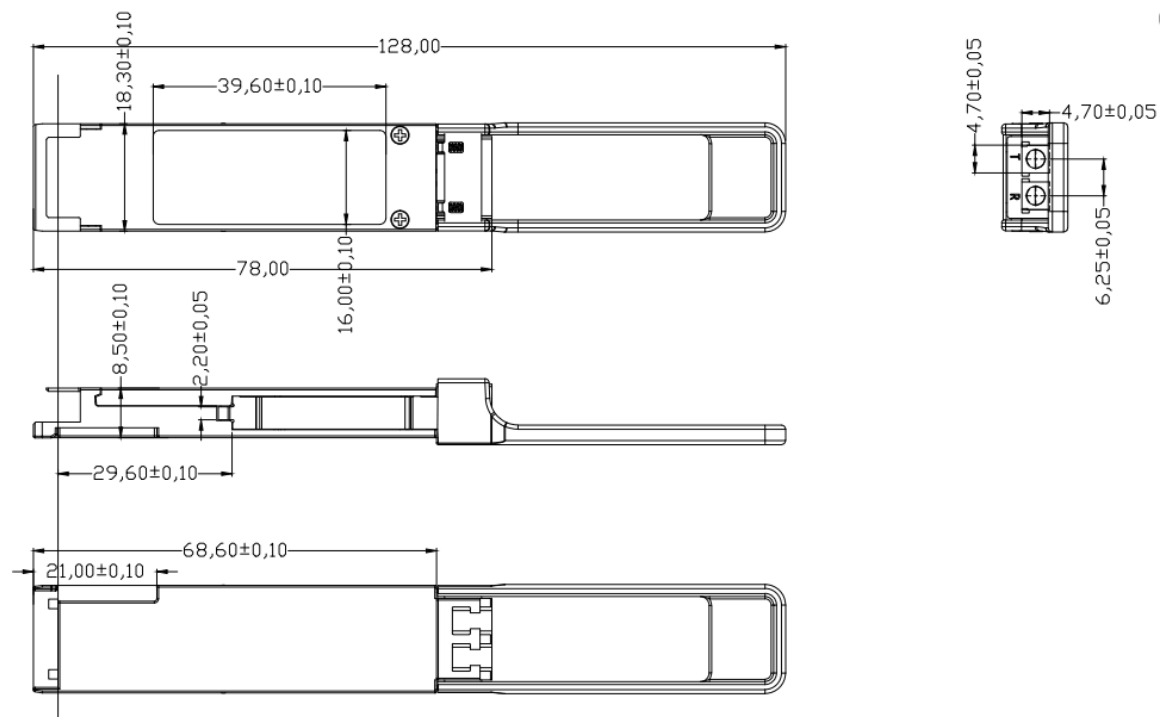
## Alarm and Warning Thresholds

QSFP28-100G-XZR4 support alarms function, indicating the values of the preceding basic performance are lower or higher than the thresholds.

Parameter	Alarm-H	Warn-H	Warn-L	Alarm-L
Temperature °C	75	70	0	-5
Voltage V	3.6	3.5	3.1	3
Tx Bias Current mA	110	100	30	20
Tx Output Power dBm	7.5	6.5	-3.5	-4.5
Rx Receive Power dBm	-4.5	-6	-32	-33

## Mechanical Specifications

QSFP28-100G-XZR4 100G ZR4 QSFP28 transceivers are compatible with the QSFP28 Specification for pluggable form factor modules.



**Figure 3. Mechanical Dimensions**

## ESD Design

Normal ESD precautions are required during the handling of this module. This transceiver is shipped in ESD protective packaging. It should be removed from the packaging and otherwise handled in an ESD protected environment utilizing standard grounded benches, floor mats, and wrist straps.

Parameter	Threshold value	Notes
ESD of high-speed pins	1KV	Human Body Model
ESD of low-speed pins	2KV	Human Body Model

Air discharge during operation	15KV	
Direct contact discharges to the case	8KV	

## Safety Specification Design



### Cautions

- 1) Do not look into fiber end faces without eye protection using an optical meter (such as magnifier and microscope) within 100 mm, unless you ensure that the laser output is disabled. When operating an optical meter, observe the operation requirements.
- 2) The RX input optical power cannot be higher than the damage threshold. You need the optical attenuator with RX in order to meet the input optical power range if necessary.
- 3) The QSFP28-100G-XZR4 is the customized module, it can only interconnect with the QSFP28-100G-XZR4 module.

CAUTION: Use of controls or adjustments or performance of procedures other than those specified herein may result in hazardous radiation exposure.

## Ordering Information

Part Number	Description
QSFP28-100G-XZR4	100GBASE-XZR4 100km QSFP28 Transceiver



Edition January, 2024  
Published by DukeVilla LLC  
Copyright © DukeVilla  
All Rights Reserved

