

# 100Gb/s QSFP28 LR4 (Dual Rate) Optical Transceiver

## Product Features

- Hot pluggable QSFP28 MSA form factor
- Compliant to IEEE 802.3ba 100GBASE-LR4&OTU4
- Supports 111.8Gb/s aggregate bit rate
- Up to 10km reach for G.652 SMF
- Single +3.3V power supply
- Operating case temperature: 0~70°C
- Transmitter: cooled 4x25Gb/s LAN WDM DFB TOSA(1295.56, 1300.05, 1304.58, 1309.14nm)
- Receiver: 4x25Gb/s PIN ROSA
- 4x25G Electrical Interface (OIF CEI-28G-VSR)
- Maximum power consumption 4.0W
- Duplex LC receptacle
- RoHS-6 compliant

## Applications

- 100GBASE-LR4 Ethernet Links
- OTU4
- Infiniband QDR and DDR interconnects
- Datacenter and Enterprise networking

This product is a 100Gb/s transceiver module designed for optical communication applications compliant to 100GBASE-LR4 of the IEEE 802.3ba standard. The module converts 4 input channels of 28Gb/s electrical data to 4 channels of LAN WDM optical signals and then multiplexes them into a single channel for 100Gb/s optical transmission. Reversely on the receiver side, the module demultiplexes a 100Gb/s optical input into 4 channels of LAN WDM optical signals and then converts them to 4 output channels of electrical data.

The central wavelengths of the 4 LAN WDM channels are 1295.56, 1300.05, 1304.58 and 1309.14 nm as members of the LAN WDM wavelength grid defined in IEEE 802.3ba. The high performance cooled LAN WDM DFB transmitters and high sensitivity PIN receivers provide superior performance for 100Gigabit Ethernet applications up to 10km links and compliant to optical interface with 100GBASE-LR4 requirements specified in IEEE 802.3ba Clause 88. The product is designed with form factor, optical/electrical connection and digital diagnostic interface according to the QSFP+ Multi-Source Agreement (MSA). It has been designed to meet the harshest external operating conditions including temperature, humidity and EMI interference.

## Ordering Information

Part Number	Description
AC-B-Q28LR4OT4-xx	QSFP28 LR4 10km dual rate optical transceiver

## Regulatory Compliance

Feature	Standard	Performance
Electromagnetic Interference (EMI)	FCC Part 15 Class B EN 55022:2010, Class B	Compatible with standards
Electromagnetic susceptibility (EMS)	EN 55024:2010	Compatible with standards
Laser Eye Safety	FDA 21CFR 1040.10 and 1040.11 EN60950, EN (IEC) 60825-1,2	Compatible with Class I laser product

### 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	degC	
Operating Case Temperature	TOP	0	70	degC	
Power Supply Voltage	VCC	-0.5	3.6	V	
Relative Humidity (non-condensation)	RH	0	85	%	
Damage Threshold, each Lane	THd	5.5		dBm	

### Recommended Operating Conditions and Power Supply Requirements

Parameter	Symbol	Min	Typical	Max	Unit	Notes
Operating Case Temperature	TC	0		+70	degC	
Power Supply Voltage	VCC	+3.135	3.3	+3.465	V	
Data Rate, each Lane			25.78	27.95	Gb/s	
Power Consumption	P			4.0	W	
Supply Current	ICC			1.21	A	
Data Rate Accuracy		-100		+100	ppm	
Control Input Voltage High			2	Vcc	V	
Control Input Voltage Low		0.8			V	
Link Distance with G.652				10	km	

**Optical Characteristics**

Parameter	Symbol	Min	Typical	Max	Unit	Notes
Wavelength Assignment	L0	1294.53	1295.56	1296.59	nm	
	L1	1299.02	1300.05	1301.09	nm	
	L2	1303.54	1304.58	1305.63	nm	
	L3	1308.09	1309.14	1310.19	nm	
<b>Transmitter</b>						
Side Mode Suppression Ratio	SMSR	30			dB	
Total Average Launch Power	PT			10.5	dBm	
Average Launch Power, each Lane	PAVG	-4.3		4.5	dBm	
Extinction Ratio	ER	4			dB	
Average Launch Power OFF Transmitter, each Lane	Poff			-30	dBm	
<b>Receiver</b>						
Damage Threshold, each Lane	THd	5.5			dBm	
Average Receive Power, each Lane		-10.6		4.5	dBm	
Receiver Sensitivity, each Lane	SEN			-10.6	dBm	
Receiver Reflectance	RR			-26	dB	
LOS Assert	LOSA	-30			dBm	
LOS Deassert	LOSD			-13	dBm	

LOS Hysteresis	LOSH	0.5			dB	
----------------	------	-----	--	--	----	--

### Digital Diagnostic Functions

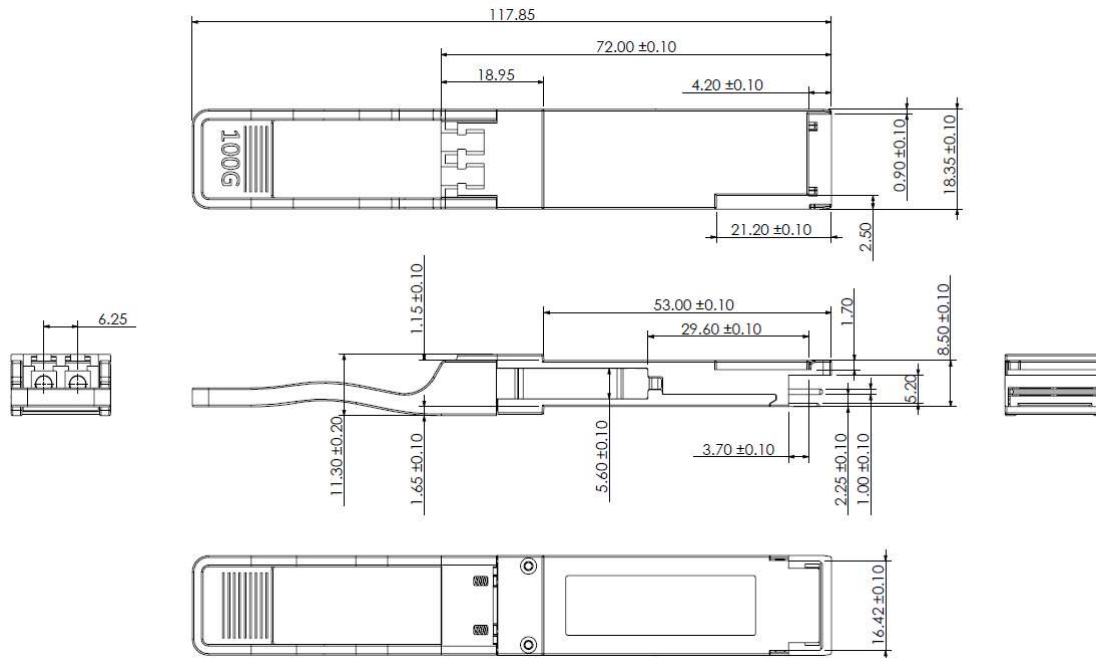
The following digital diagnostic characteristics are defined over the normal operating conditions unless otherwise specified.

Parameter	Symbol	Min	Max	Unit	Notes
Temperature monitor absolute error	DMI_Temp	-3	+3	degC	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	-2	+2	dB	1
Channel Bias current monitor	DMI_Ibias	-10%	+10%	mA	
Channel TX power monitor absolute error	DMI_TX	-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.

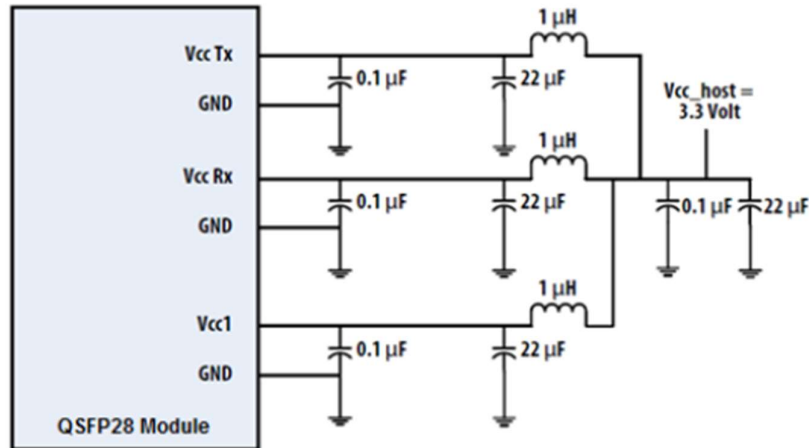
**Mechanical Dimension**



**ESD**

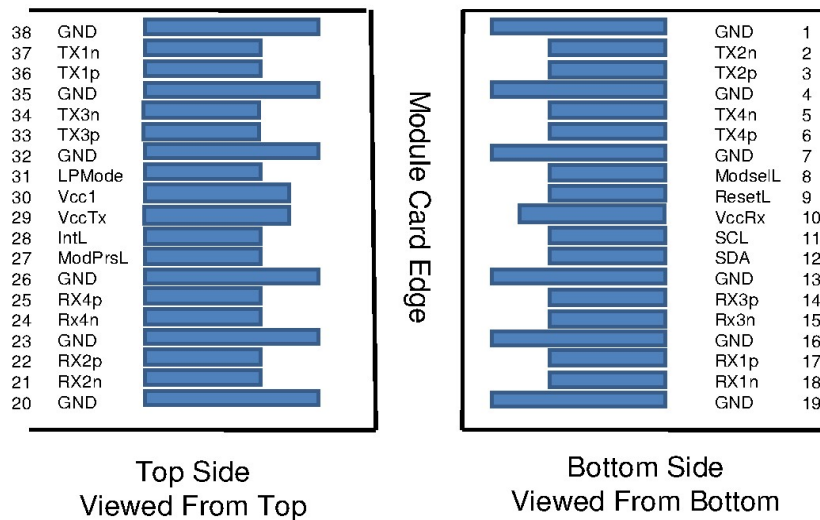
This transceiver is specified as ESD threshold 1kV for high speed data pins and 2kV for all other electrical input pins, tested per MIL-STD-883, Method 3015.4 /JESD22-A114-A (HBM). However, normal ESD precautions are still required during the handling of this module. This transceiver is shipped in ESD protective packaging. It should be removed from the packaging and handled only in an ESD protected environment.

**Recommended Power Supply Filter**



**Figure 3. Recommended Power Supply Filter**

**Pin Assignment and Description**



PIN #	Logic	Symbol	Description	Notes
1		GND	Ground	
2	CML-I	Tx2n	Transmitter Inverted Data Input	
3	CML-I	Tx2p	Transmitter Non-Inverted Data output	
4		GND	Ground	
5	CML-I	Tx4n	Transmitter Inverted Data Input	
6	CML-I	Tx4p	Transmitter Non-Inverted Data output	
7		GND	Ground	
8	LVTTLL-I	ModSelL	Module Select	
9	LVTTLL-I	ResetL	Module Reset	
10		VccRx	+3.3V Power Supply Receiver	
11	LVC MOS-I/O	SCL	2-Wire Serial Interface Clock	
12	LVC MOS-I/O	SDA	2-Wire Serial Interface Data	
13		GND	Ground	
14	CML-O	Rx3p	Receiver Non-Inverted Data Output	
15	CML-O	Rx3n	Receiver Inverted Data Output	
16		GND	Ground	
17	CML-O	Rx1p	Receiver Non-Inverted Data Output	
18	CML-O	Rx1n	Receiver Inverted Data Output	
19		GND	Ground	
20		GND	Ground	
21	CML-O	Rx2n	Receiver Inverted Data Output	

22	CML-O	Rx2p	Receiver Non-Inverted Data Output
23		GND	Ground
24	CML-O	Rx4n	Receiver Inverted Data Output
25	CML-O	Rx4p	Receiver Non-Inverted Data Output
26		GND	Ground
27	LVTTTL-O	ModPrsL	Module Present
28	LVTTTL-O	IntL	Interrupt
29		VccTx	+3.3 V Power Supply transmitter
30		Vcc1	+3.3 V Power Supply
31	LVTTTL-I	LPMode	Low Power Mode
32		GND	Ground
33	CML-I	Tx3p	Transmitter Non-Inverted Data Input
34	CML-I	Tx3n	Transmitter Inverted Data Output
35		GND	Ground
36	CML-I	Tx1p	Transmitter Non-Inverted Data Input
37	CML-I	Tx1n	Transmitter Inverted Data Output
38		GND	Ground