

# Product Specification Datasheet

TNQ2LW6XL-CD804

## QSFP28 100G ZR4 Optical Transceiver

### Product Features

- Hot pluggable QSFP28 MSA form factor
- Compliant to Ethernet 100GBASE-ZR4 and OTN OTU4 4L1-9C1F Lite
- Up to 80km reach for G.652 SMF without FEC
- Single +3.3V power supply
- Operating case temperature: 0~70°C
- Transmitter: cooled 4x25Gb/s LAN WDMTOSA (1295.56, 1300.05, 1304.58, 1309.14nm)
- Receiver: 4x25Gb/s SOA+PIN ROSA
- 4x28G Electrical Serial Interface (CEI-28G-VSR)
- Maximum power consumption 6.5W
- Duplex LC receptacle
- RoHS-6 compliant

### Applications

- 100GBASE-ZR4 Ethernet Links
- Infiniband QDR and DDR interconnects

This product is a 100Gb/s transceiver module designed for optical communication applications compliant to Ethernet IEEE 802.3ba standard. The module converts 4 input channels of 25Gb/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 de-multiplexes 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 standard. The high performance cooled LAN WDM EML transmitters and SOA+PIN receivers provide superior performance for 100Gigabit applications up to 80km links and compliant to optical interface with 100GBASE-ZR4 requirements.

The product is designed with form factor, optical/electrical connection and digital diagnostic interface according to the QSFP28 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
TNQ2LW6XL-CD804	QSFP28 ZR4 optical transceiver with full real-time digital diagnostic monitoring and pull tab
<b>For More Information:</b> Shenzhen Trustnuo.,Ltd Address: 1301-1304, 13/F, B Building, Qinghu Technology Park, Qingxiang Rd., Longhua District, Shenzhen, Guangdong, China Phone:0086-755-83069070 Fax: 0086-755-83069070 Email: sales@trustnuo.com	

### 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

The operation in excess of any 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	5	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	TOP	0		70	degC	Operating Case Temperature
Power Supply Voltage	VCC	3.135	3.3	3.465	V	Power Supply Voltage
Data Rate, each Lane			25.78125		Gb/s	Data Rate, each Lane
Control Input Voltage High		2		Vcc	V	Control Input Voltage High
Control Input Voltage Low		0		0.8	V	Control Input Voltage Low
Link Distance with G.652	D	0.002		30	km	Link Distance with G.652

## Electrical Characteristics

Parameter	Test Point	Min	Typical	Max	Unit	Notes
Power Consumption				5	W	
Supply Current	Icc			1.9	A	
Single-ended Input Voltage Tolerance (Note 1)		-0.3		4.0	V	Referred to TP1 signal common
AC Common Mode Input Voltage Tolerance		15			mV	RMS
Differential Input Voltage Swing Threshold		50			mVpp	LOSA Threshold
Differential Input Voltage Swing	Vin,pp	190		700	mVpp	
Differential Input Impedance	Zin	90	100	110	Ohm	
Single-ended Output Voltage		-0.3		4.0	V	Referred to signal common
AC Common Mode Output Voltage				7.5	mV	RMS
Differential Output Voltage Swing	Vout,pp	300		850	mVpp	
Differential Output Impedance	Zout	90	100	110	Ohm	

### Notes:

1. The single ended input voltage tolerance is the allowable range of the instantaneous input signals.

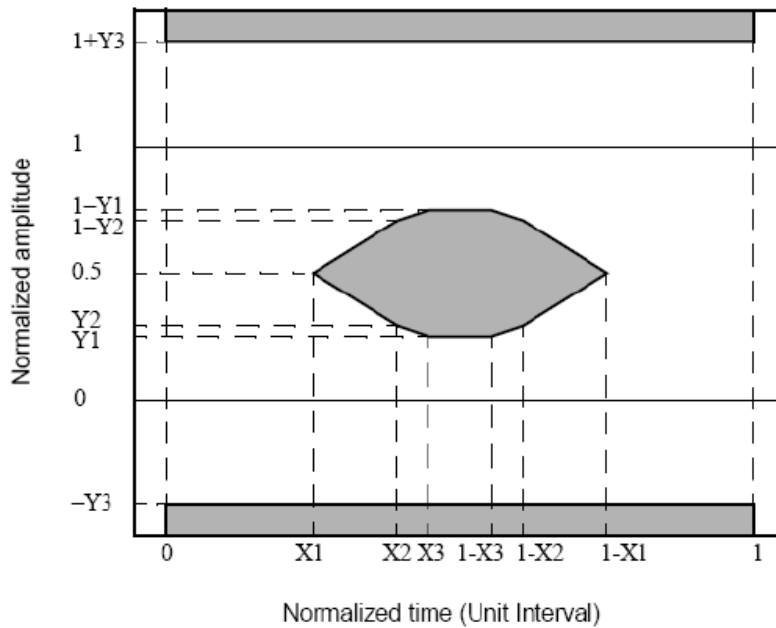
Optical Characteristics

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	8		12.5	dBm	
Average Launch Power,each Lane	PAVG	2		6.5	dBm	
OMA, each Lane	POMA	0.1		4.5	dBm	1
Difference in Launch Power between any Two Lanes (OMA)	Ptx,diff			3	dB	
Launch Power in OMA minus Transmitter and Dispersion Penalty (TDP), each Lane		-0.65			dBm	
TDP, each Lane	TDP			2.5	dB	
Extinction Ratio	ER	6			dB	
Optical Return Loss Tolerance	TOL			20	dB	
Transmitter Reflectance	RT			-12	dB	
Eye Mask{X1, X2, X3, Y1, Y2, Y3}		{0.25, 0.4, 0.45, 0.25, 0.28, 0.4}				
Average Launch Power OFF Transmitter, each Lane	Poff			-30	dBm	
<b>Receiver</b>						
Damage Threshold, each Lane	THd	6.5			dBm	2
Total Average Receive Power				3	dBm	
Average Receive Power, each Lane		-28		-7	dBm	for 80km Link Distance
Receive Power (OMA), each Lane				-7	dBm	
Receiver Sensitivity (OMA), eachLane	SEN			-28	dBm	for BER = 1x10 <sup>-5</sup>
Stressed Receiver Sensitivity(AOP), each Lane				-26	dBm	for BER = 1x10 <sup>-5</sup>
Difference in Receive Power between any Two Lanes (OMA)	Prx,diff			4.5	dB	
LOS Assert	LOSA		-40		dBm	
LOS Deassert	LOSD		-29		dBm	
LOS Hysteresis	LOSH	0.5			dB	
Receiver Electrical 3 dB upper Cutoff Frequency, each Lane	Fc			31	GHz	
<b>Conditions of Stress Receiver Sensitivity Test (Note 5)</b>						
Vertical Eye Closure Penalty, eachLane			1.5		dB	

Stressed Eye J2 Jitter, each Lane						
Stressed Eye J9 Jitter, each Lane			0.47		UI	

**Notes:**

1. See Figure 1 below.
2. The receiver shall be able to tolerate, without damage, continuous exposure to a modulated optical input signal having this power level on one lane. The receiver does not have to operate correctly at this input power.
3. Vertical eye closure penalty and stressed eye jitter are test conditions for measuring stressed receiver sensitivity. They are not characteristics of the receiver.



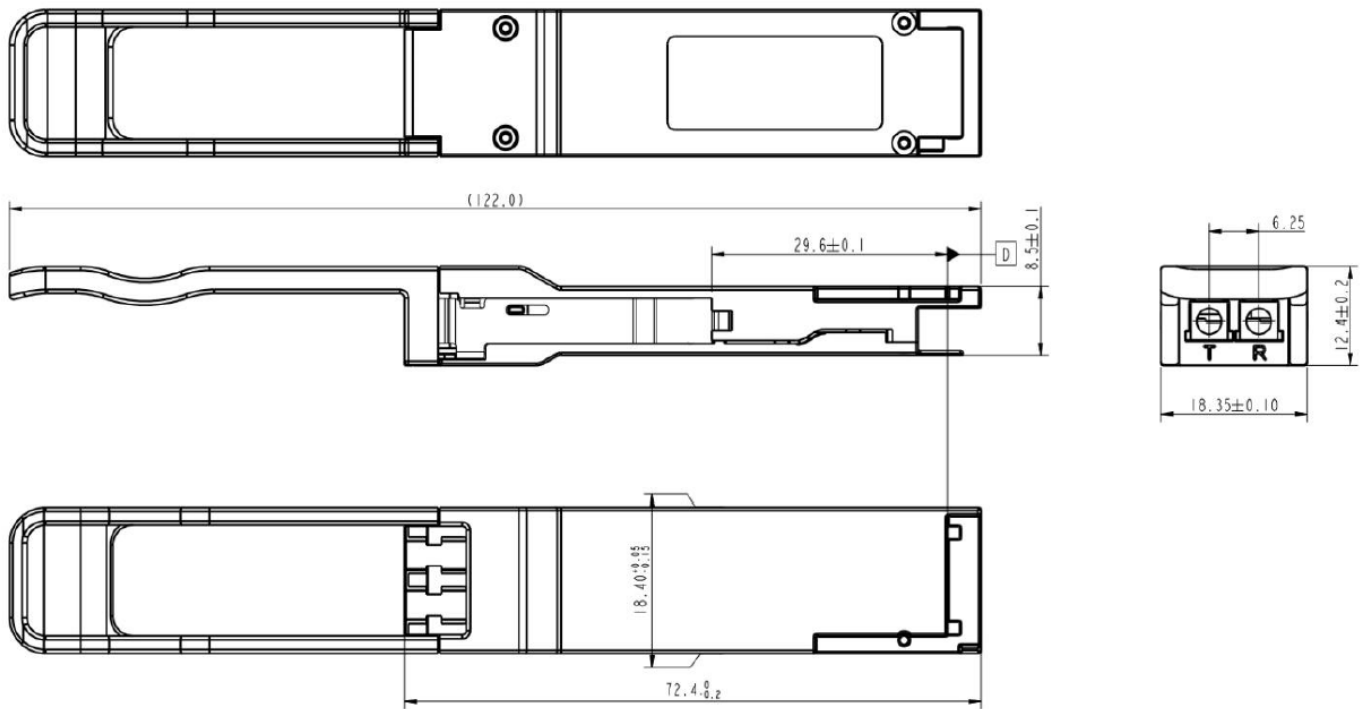
**Figure1.EyeMaskDefinition**

**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 temp
Supply voltage monitor absolute error	DMI_VCC	-0.1	0.1	v	Full operating range
Channel RX power monitor absolute error	DMI_RX	-3	3	dB	Per channel
Channel Bias current monitor	DMI_Ibias	-10%	10%	mA	Per channel
Channel TX power monitor absolute error	DMI_TX	-3	3	dB	Per channel

Mechanical Dimension



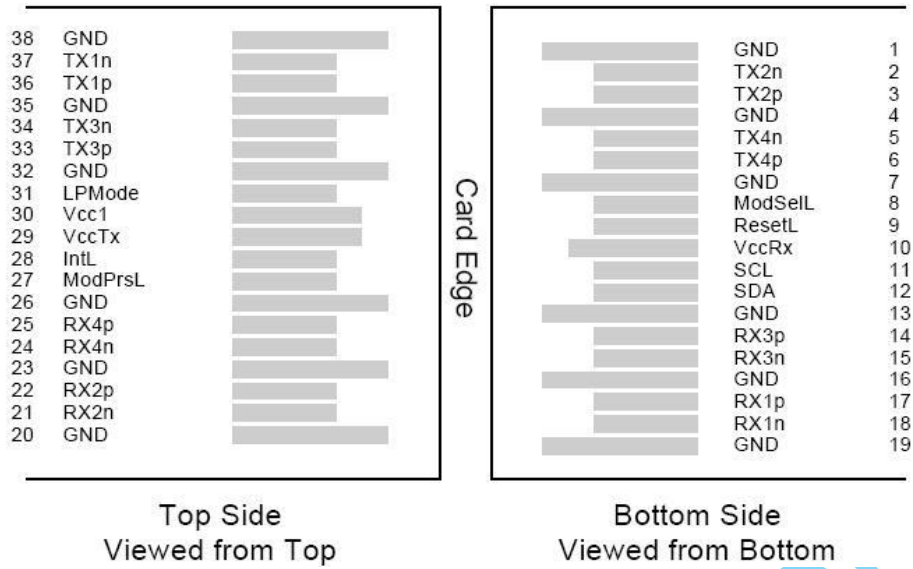
ESD

This transceiver is specified as ESD threshold 1kV for SFI APDs and 2kV for all other electrical input APDs, 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.

Laser Safety

This is a Class 1 Laser Product according to IEC 60825-1:2007. This product complies with 21 CFR 1040.10 and 1040.11 except for deviations pursuant to Laser Notice No. 50, dated (June 24, 2007).

PIN Assignment and Description



Pin Assignment

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	LVCNOS-I/O	SCL	2-Wire Serial Interface Clock	
12	LVCNOS-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	LPMMode	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	

**Order information**

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