

## **100G QSFP28 BiDi ZR4 Optical Transceiver**

### **PN: 3CW-QSFP28-23-ZR/ 3CW-QSFP28-32-ZR**

#### **Features:**

- 2 Hot pluggable QSFP28 MSA form factor
- 2 Compliant to IEEE 802.3ba 100GBASE-ZR4
- 2 Support line rates from 103.125 Gb/s to 112.2 Gb/s OTU4
- 2 Up to 80km reach for G.652 SMF with FEC
- 2 Single +3.3V power supply
- 2 Operating case temperature: 0~70°C
- 2 LAN WDM EML laser and PIN receiver with SOA
- 2 Maximum power consumption 6.5W
- 2 Single LC optical receptacle
- 2 Built-in digital diagnostic function
- 2 RoHS compliant

#### **Applications:**

- 2 100G Ethernet/OUT4 & 100GBASE-ZR4
- 2 Telecom networking

#### **General Description**

3C-LINK BiDi 100Gb/s 80KM transceiver module designed for optical communication applications compliant to 100GBASE-ZR4 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 product is integrated a 100Gb/s(4x25) transmitter optical subassembly and a hermetically sealed 4-lambda receiver with SOA. The Tx integrating a high-speed electro-absorptive laser, a micro-TEC, and a monitor PD in a hermetic small form-factor gold box package. P-I-N photodiodes which serve as power monitors are integrated to monitor the light from backside the laser. The Rx light is coupled via free space optics into semiconductor optical amplifier(SOA) and then to a Demultiplexer, and then into the four high speed P-I-N detector. Output signal of the photo detector is amplified by TIA.

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.

### Transceiver Block Diagram

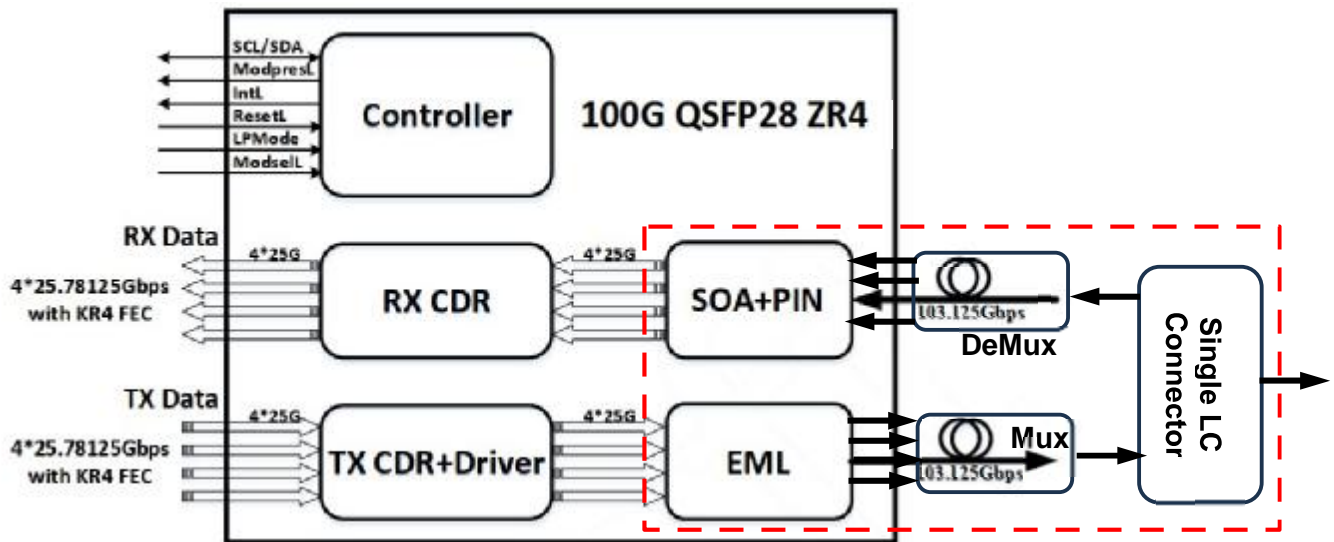


Figure 1. Transceiver Block Diagram

### 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	Units	Note
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	-6.0		dBm	

### Recommended Operating Conditions and Power Supply Requirements

Parameter	Symbol	Min	Typical	Max	Units
Operating Case Temperature	TOP	0		70	degC
Power Supply Voltage	VCC	3.135	3.3	3.465	V
Data Rate, each Lane			25.78125	27.9525	Gb/s
Control Input Voltage High		2		Vcc	V
Control Input Voltage Low		0		0.8	V

## Electrical Characteristics

The following electrical characteristics are defined over the Recommended Operating Environment unless otherwise specified.

Parameter	Symbol	Min	Typical	Max	Units	Notes
Power Consumption				6.5	W	
Supply Current	Icc			1.9	A	
<b>Transmitter (each Lane)</b>						
Data Rate, each lane			25.78125	27.95	Gbps	
Differential Voltage pk-pk	Vpp			900	mV	
Common Mode Voltage	Vcm	-350		2850	mV	At 1MHz
Differential Termination Resistance Mismatch				10	%	
Transition time ,20 to 80%	Trise/Tfall	10			ps	
Eye width	EW15	0.46				
Eye height	EH15	95				
<b>Receiver (each Lane)</b>						
Data Rate, each lane			25.78125	27.95	Gbps	
Differential Voltage, pkpk	Vpp			900	mV	
Common Mode Voltage	Vcm	-350		2850	mV	2
Common Mode Noise, RMS	Vrms			17.5	mV	
Differential Termination Resistance Mismatch				10	%	At 1MHz

## Optical Characteristics

<b>Transmitter</b>						
Parameter	Symbol	Min	Typical	Max	Unit	Notes
Lane Wavelengths (Group 0)	$\lambda_0$	1294.80	1295.56	1296.49	nm	
	$\lambda_1$	1299.29	1300.05	1300.99	nm	
	$\lambda_2$	1303.81	1304.58	1305.53	nm	
	$\lambda_3$	1308.36	1309.14	1310.09	nm	
Lane Wavelengths (Group 1)	$\lambda_0$	1272.51	1273.54	1274.58	nm	
	$\lambda_1$	1276.86	1277.89	1278.93	nm	

	$\lambda_2$	1281.21	1282.26	1283.31	nm	
	$\lambda_3$	1285.61	1286.66	1287.71	nm	
SMSR	SMSR	30			dB	
Total Average Launch Power	PT	8		12.5	dBm	
Average Launch	P <sub>AVG</sub>	2		6.5	dBm	
Power, each Lane						
Difference in launch Power between any two Lanes(OMA)				3	dB	
Extinction Ratio	ER	6			dB	
Average Launch Power off Transmitter,each Lane	P <sub>off</sub>			-30	dBm	
Relative Intensity Noise	RIN			-130	dB/ Hz	
Output Eye Mask definition {X1 , X2 , X3 , Y1, Y2, Y3}	{0.25, 0.4, 0.45, 0.25, 0.28, 0.4}					
Receiver						
Lane Wavelengths (Group 0)	$\lambda_0$	1272.51	1273.54	1274.58	nm	
	$\lambda_1$	1276.86	1277.89	1278.93	nm	
	$\lambda_2$	1281.21	1282.26	1283.31	nm	
	$\lambda_3$	1285.61	1286.66	1287.71	nm	
Lane Wavelengths (Group 1)	$\lambda_0$	1294.80	1295.56	1296.49	nm	
	$\lambda_1$	1299.29	1300.05	1300.99	nm	
	$\lambda_2$	1303.81	1304.58	1305.53	nm	
	$\lambda_3$	1308.36	1309.14	1310.09	nm	
Total Damage Threshold	TH <sub>d</sub>			5.5	dBm	1
Average Receive Power,each Lane		-28		0	dBm	

Receiver Sensitivity, each Lane	SEN			-28@25.78G -27@27.95G	dBm	2
				-21.4@25.78G -20.5@27.95G	dBm	3
LOS Assert	LOSA	-40			dBm	
LOS Deassert	LOSD			-29	dBm	
LOS Hysteresis	LOSH	0.5			dB	

**Notes:**

1. 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.
2. Measured with PRBS 2<sup>31</sup>-1 test pattern, BER 5.0E-5.
3. Measured with PRBS 2<sup>31</sup>-1 test pattern, BER 1.0E-12.

### Pin Assignment and Description

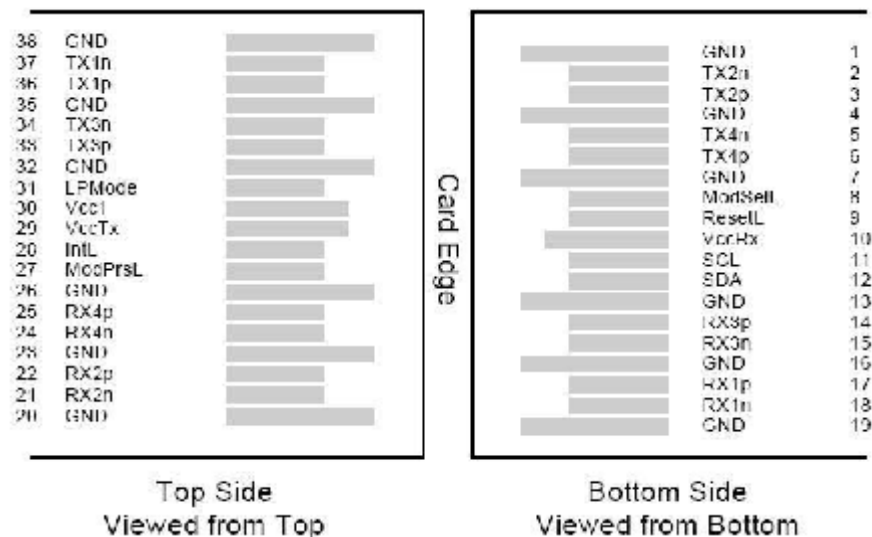


Figure 2. Electrical Pin-out Details

### Pin Definition

PIN	Logic	Symbol	Name/Description	Notes
1		GND	Ground	1
2	CML-I	Tx2n	Transmitter Inverted Data Input	
3	CML-I	Tx2p	Transmitter Non-Inverted Data output	
4		GND	Ground	1
5	CML-I	Tx4n	Transmitter Inverted Data Input	
6	CML-I	Tx4p	Transmitter Non-Inverted Data output	

7		GND	Ground	1
8	LVTLL-I	ModSelL	Module Select	
9	LVTLL-I	ResetL	Module Reset	
10		VccRx	+3.3V Power Supply Receiver	2
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	1
17	CML-O	Rx1p	Receiver Non-Inverted Data Output	
18	CML-O	Rx1n	Receiver Inverted Data Output	
19		GND	Ground	1
20		GND	Ground	1
21	CML-O	Rx2n	Receiver Inverted Data Output	
22	CML-O	Rx2p	Receiver Non-Inverted Data Output	
23		GND	Ground	1
24	CML-O	Rx4n	Receiver Inverted Data Output	1
25	CML-O	Rx4p	Receiver Non-Inverted Data Output	
26		GND	Ground	1
27	LVTTL-O	ModPrsL	Module Present	
28	LVTTL-O	IntL	Interrupt	
29		VccTx	+3.3 V Power Supply transmitter	2
30		Vcc1	+3.3 V Power Supply	2
31	LVTTL-I	LPMode	Low Power Mode	
32		GND	Ground	1
33	CML-I	Tx3p	Transmitter Non-Inverted Data Input	
34	CML-I	Tx3n	Transmitter Inverted Data Output	
35		GND	Ground	1
36	CML-I	Tx1p	Transmitter Non-Inverted Data Input	
37	CML-I	Tx1n	Transmitter Inverted Data Output	
38		GND	Ground	1

**Notes:**

1. GND is the symbol for signal and supply (power) common for the QSFP28 module. All are common within the 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. VccRx, Vcc1 and VccTx are the receiving and transmission power suppliers and shall be applied concurrently. Recommended host board power supply filtering is shown in Figure 3 below. Vcc Rx, Vcc1 and Vcc Tx may be internally connected within the module in any combination.

## EEPROM Information

EEPROM memory map specific data field description is as below

2-wire serial address, 1010000x (A0h)\*



Figure3. QSFP Memory Map

## Digital Diagnostic Functions

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

Parameter	Symbol	Min	Max	Units	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_Ch	-2	2	dB	1
Channel Bias current monitor	DMI_Ibias_Ch	-10%	10%	mA	
Channel TX power monitor absolute error	DMI_TX_Ch	-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 Dimensions

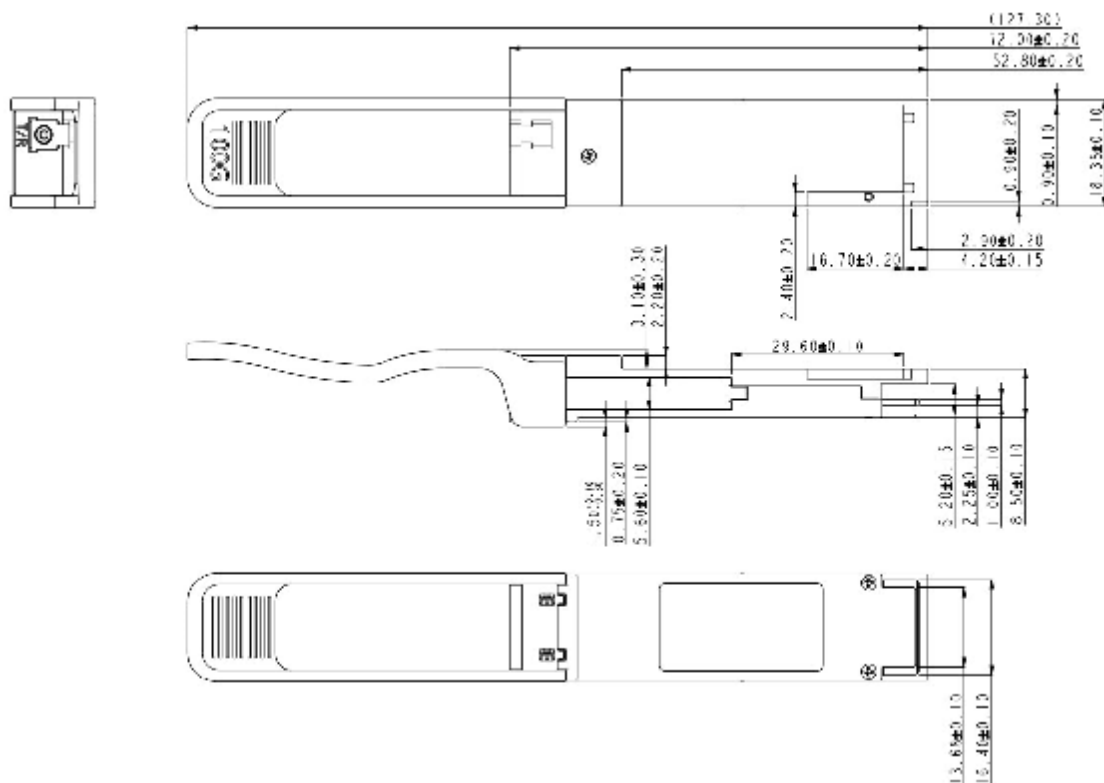


Figure 4. Mechanical Outline

## Ordering information

Part Number	Product Description
3CW-QSFP28-32-ZR	QSFP28 BiDi, 103.125/112Gb/s, T1295, 1300, 1304, 1309nm/R1273,1277,1282,1286nm, 80km with KP4-FEC, 0~70°C
3CW-QSFP28-23-ZR	QSFP28 BiDi, 103.125/112Gb/s, T1273, 1277, 1282, 1286nm/R1295,1300,1304,1309nm, 80km with KP4-FEC, 0~70°C

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