100GBASE-ZR4 QSFP28 1310nm 80km DDM SMF Transceiver

P/N: QT-QSFP28-ZR4

Product Features

- Hot pluggable QSFP28 MSA form factor
- Compliant to Ethernet 100GBASE-ZR4 Lite
- Supports 103.1Gb/s aggregate bit rate
- Up to 80km reach for G.652 SMF with FEC
- Single +3.3V power supply
- Operating case temperature: 0~70oC
- Transmitter: cooled 4x25Gb/s LAN WDM EML TOSA (1295.56, 1300.05, 1304.58,1309.14nm)
- Receiver: 4x25Gb/s APD ROSA
- 4x25G electrical interface (OIF CEI-28G-VSR)
- Maximum power consumption 4.5W
- Duplex LC receptacle
- RoHS-6 compliant

Applications

- 100GBASE-ZR4 Ethernet Links
- Infiniband QDR and DDR interconnects
- Client-side 100G Telecom connections

1. 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	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	-3.0		dBm	

2. Recommended Operating Conditions and Power Supply Requirements

Parameter	Symbol	Min	Typical	Max	Units	Notes
Operating Case Temperature	TOP	0		70	degC	
Power Supply Voltage	VCC	3.135	3.3	3.465	V	
Data Rate, each Lane			25.78125		Gb/s	
Data Rate Accuracy		-100		100	ppm	
Control Input Voltage High		2		Vcc	V	
Control Input Voltage Low		0		0.8	V	
Link Distance with G.652 (without FEC)	D1			30	km	1
Link Distance with G.652 (with FEC)	D2			40	km	1

Notes1 : Depending on actual fiber loss/km (link distance specified is for fiber insertion loss of 0.4dB/km).

3. Electrical Characteristics

Parameter	Test Point	Min	Typical	Max	Units	Notes
Power Consumption				4.5	W	
Supply Current	Icc			1.36	A	
Transmitter (each Lane)						
Overload Differential Voltage pk-pk	TP1a	900			mV	
Common Mode Voltage (Vcm)	TP1	-350		2850	mV	1
Differential Termination Resistance Mismatch	TP1			10	%	At 1MHz
Differential Return Loss (SDD11)	TP1			See CEI-28G-VSR Equation 13-19	dB	
Common Mode to Differential conversion and Differential to Common Mode conversion (SDC11, SCD11)	TP1			See CEI-28G-VSR Equation 13-20	dB	

Stressed Input Test	TP1a	See CEI-28G-VSR Section 13.3.11.2.1				
Receiver (each Lane)						
Differential Voltage, pk-pk	TP4			900	mV	
Common Mode Voltage (Vcm)	TP4	-350		2850	mV	1
Common Mode Noise, RMS	TP4			17.5	mV	
Differential Termination Resistance Mismatch	TP4			10	%	At 1MHz
Differential Return Loss (SDD22)	TP4			See CEI-28G-VSR Equation 13-19	dB	
Common Mode to Differential conversion and Differential to Common Mode conversion (SDC22, SCD22)	TP4			See CEI-28G-VSR Equation 13-21	dB	
Common Mode Return Loss (SCC22)	TP4			-2	dB	2
Transition Time, 20 to 80%	TP4	9.5			ps	
Vertical Eye Closure (VEC)	TP4			5.5	dB	
Eye Width at 10-15 probability (EW15)	TP4	0.57			UI	
Eye Height at 10-15 probability (EH15)	TP4	228			mV	

Notes:

1. Vcm is generated by the host. Specification includes effects of ground offset voltage.
2. From 250MHz to 30GHz.

4. Optical Characteristics

Parameter	Symbol	Min	Typical	Max	Units	Notes
Lane Wavelength	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	
Transmitter						
SMSR	SMSR	30			dB	
Total Average Launch Power	PT			10.5	dBm	
Average Launch Power, each Lane	PAVG	-2.9		4.5	dBm	1
OMA, each Lane	POMA	0.1		4.5	dBm	2
Difference in Launch Power between any Two Lanes (OMA)	Ptx,diff			3.6	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	7			dB	
RIN20OMA	RIN			-130	dB/Hz	
Optical Return Loss Tolerance	TOL			20	dB	
Transmitter Reflectance	RT			-12	dB	
Average Launch Power OFF Transmitter, each Lane	Poff			-30	dBm	
Eye Mask{X1, X2, X3, Y1, Y2, Y3}		{0.25, 0.4, 0.45, 0.25, 0.28, 0.4}				
Receiver						
Damage Threshold, each Lane	THd	-3.0			dBm	3
Average Receive Power, each Lane		-16.9		-4.9	dBm	for 30km Link Distance
Average Receive Power, each Lane		-20.9		-4.9	dBm	for 40km Link Distance
Receive Power (OMA), each Lane				-1.9	dBm	
Receiver Sensitivity (OMA), each Lane	SEN1			-14.65	dBm	for BER = 1x10- 12
Stressed Receiver Sensitivity (OMA), each Lane				-12.65	dBm	for BER = 1x10- 12
Receiver Sensitivity (OMA), each Lane	SEN2			-18.65	dBm	for BER = 5x10-5
Stressed Receiver Sensitivity (OMA), each Lane				-16.65	dBm	for BER = 5x10-5
Receiver reflectance				-26	dB	
Difference in Receive Power between any Two Lanes (Average and OMA)	Prx,diff			3.6	dB	
LOS Assert	LOSA		-26		dBm	
LOS Deassert	LOSD		-24		dBm	
LOS Hysteresis	LOSH	0.5			dB	
Receiver Electrical 3 dB upper Cutoff Frequency, each Lane	Fc			31	GHz	
Conditions of Stress Receiver Sensitivity Test (Note 4)						
Vertical Eye Closure Penalty, each Lane			1.5		dB	
Stressed Eye J2 Jitter, each Lane			0.3		UI	
Stressed Eye J9 Jitter, each Lane			0.47		UI	

Notes:

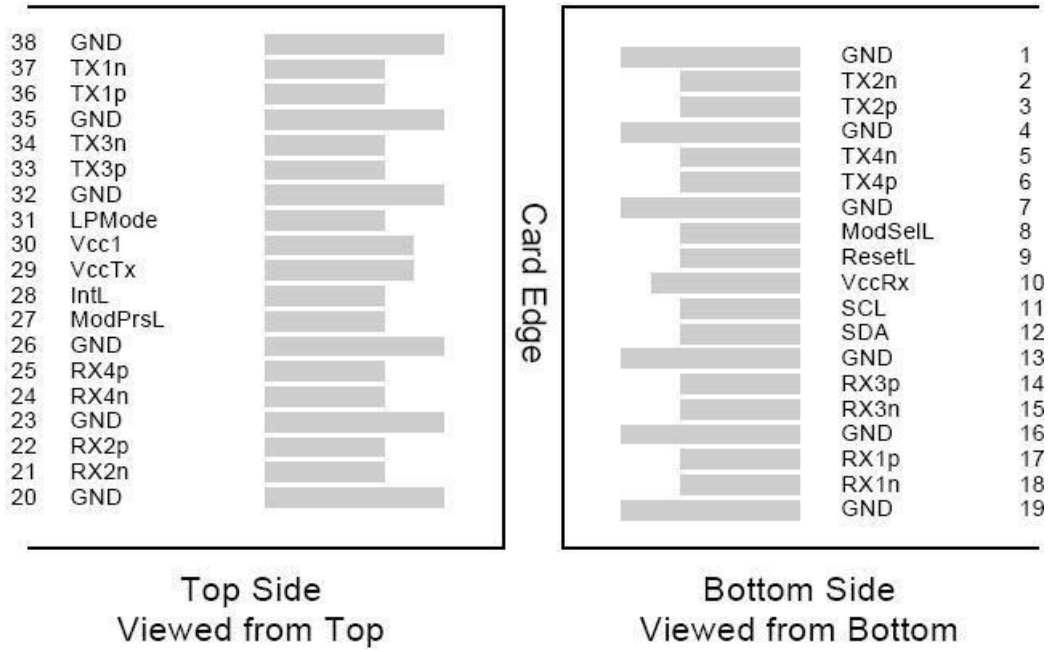
1. The minimum average launch power spec is based on ER not exceeding 9.5dB and transmitter OMA higher than 0.1dBm. Even if the TDP < 0.75 dB, the OMA min must exceed the minimum value specified here.
2. The receiver shall be able to tolerate, without damage, continuous exposure to a modulated optical input signal having this
3. power level on one lane. The receiver does not have to operate correctly at this input power.
4. Vertical eye closure penalty, stressed eye J2 jitter, and stressed eye J9 jitter are test conditions for measuring stressed receiver sensitivity. They are not characteristics of the receiver.

5. Digital Diagnostic Functions

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.

6. Pin Assignment and Description



MSA compliant Connector

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	

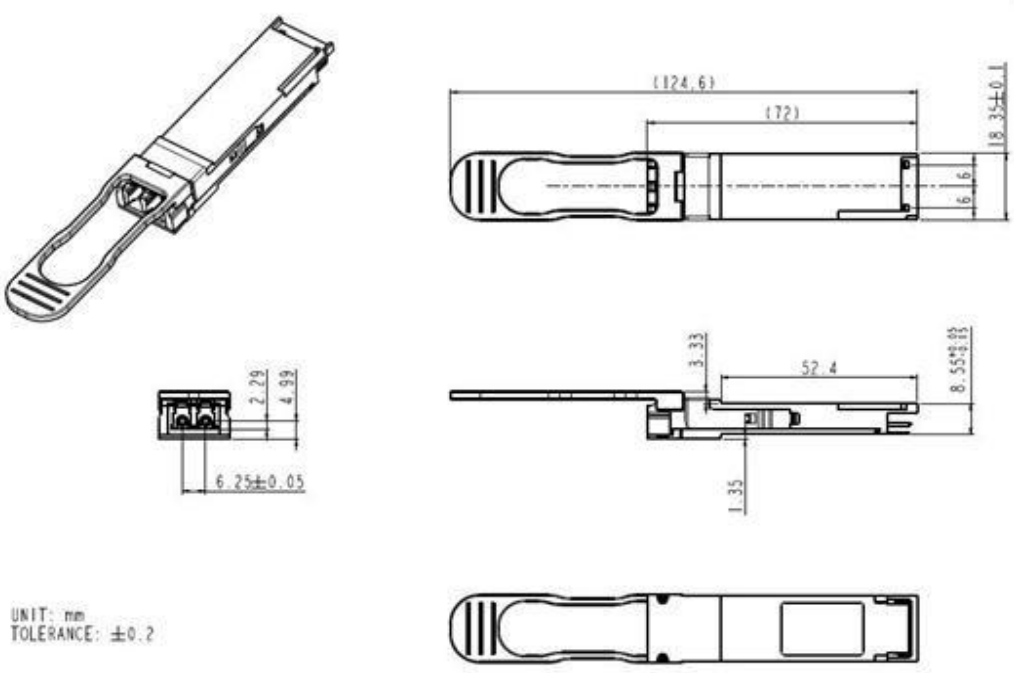
7		GND	Ground	1
8	LVTLL-I	ModSelL	Module Select	
9	LVTLL-I	ResetL	Module Reset	
10		VccRx	+3.3V Power Supply Receiver	2
11	LVCMOS-I/O	SCL	2-Wire Serial Interface Clock	
12	LVCMOS-I/O	SDA	2-Wire Serial Interface Data	
13		GND	Ground	
14	CML-O	Rx3p	Receiver Non-Inverted Data Output	
15	CML-O	Rx3n	Receiver 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. The connector pins are each rated for a maximum current of 1000mA.

7. Mechanical Dimensions



8. Ordering Information

Part Number	Product Description
QT-QSFP28-ZR4	QSFP28,100Gb/s, LAN WDM, DDM, LC Connector, 80km, 0°C~+70°C
QT-QSFP28-SR4	QSFP28,100Gb/s, 850nm, MMF, 100M, DDM, MPO Connector , 0℃ ~ +70℃
QT-QSFP28-LR4	QSFP28,100Gb/s, 1310nm ,SMF, 10KM, DDM, LC connector, 0℃ ~ +70℃
QT-QSFP28-ER4	QSFP28,100Gb/s, LAN WDM, DDM, LC Connector, 40km, 0°C~+70°C