

100G QSFP28 ER4 Optical Transceiver

Part Number: VQ-1CER4CS-BA

VQ-1CER4CS-BA is a high performance QSFP28 transceiver module for 100 Gigabit Ethernet data links over single-mode fiber.

Features

- Hot pluggable QSFP28 MSA form factor
- Compliant to Ethernet 100GBASE-ER4 Lite
- The QSFP28 has CDR inside, Supports 103.1Gb/s aggregate bit rate
- Up to 30km reach for G.652 SMF without FEC
- Up to 40km reach for G.652 SMF with FEC
- Single +3.3V power supply
- Operating case temperature: 0~70°C
- 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 compliant

Applications

- 100GBASE-ER4 Ethernet Links
- InfiniBand QDR and DDR interconnects
- Client-side 100G Telecom connections

Ordering Information

Part Number	Data Rate	Link Length	Laser	Detector	Fiber Type	Temperature
VQ-1CER4CS-BA	100G	30km w/o FEC 40km w/ FEC	1310nm EML DFB	1310nm APD ROSA	SMF	0 – 70°C

Product Overview

Vitex **VQ-1CER4CS-BA** (100GE QSFP28) is a 100Gb/s transceiver module designed for optical communication applications compliant to Ethernet 100GBASE-ER4 Lite standard.

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 EA-DFB transmitters and high sensitivity APD receivers provide superior performance for 100Gigabit Ethernet applications up to 30km links without FEC and 40km links with FEC.

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.

Absolute Maximum Ratings

Parameter	Symbol	Min	Max	Unit
Storage Temperature	T _S	-40	85	°C
Operating Case Temperature	T _{OP}	0	70	°C
Power Supply Voltage	V _{CC}	-0.5	3.6	V
Relative Humidity (non-condensation)	RH	0	85	%
Damage Threshold, each Lane	TH _d	-3.0		dBm

Recommended Operating Conditions

Parameter	Symbol	Min	Typical	Max	Unit
Operating Case Temperature	T _{OP}	0		70	°C
Power Supply Voltage	V _{CC}	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		V _{cc}	V
Control Input Voltage Low		0		0.8	V
Link Distance with G.652 (without FEC) ¹	D1			30	km
Link Distance with G.652 (with FEC) ¹	D2			40	km

Note:

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

Electrical Specifications

Parameter	Symbol	Min	Typical	Max	Unit
Power Consumption				4.5	W
Supply Current	I_{cc}			1.36	A
Transmitter (Each lane)					
Overload Differential Voltage pk-pk @ TP1		900			mV
Common Mode Voltage (Vcm) @ TP1 ¹		-350		2850	mV
Differential Termination Resistance Mismatch @ TP1 (at 1MHz)				10	%
Receiver (Each lane)					
Differential Voltage, pk-pk @ TP4				900	mV
Common Mode Voltage (Vcm) @ TP4 ¹		-350		2850	mV
Common Mode Noise, RMS @ TP4				17.5	mV
Differential Termination Resistance Mismatch @ TP4 (at 1MHz)				10	%
Common Mode Return Loss (SCC22) @ TP4 ²				-2	dB
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

Note:

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

Optical – Transmitter

Parameter	Symbol	Min	Typical	Max	Unit
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
SMSR	SMSR	30			dB
Total Average Launch Power	P _T			10.5	dBm
Average Launch Power, each Lane ¹	P _{AVG}	-2.9		4.5	dBm
OMA, each Lane ²	P _{OMA}	0.1		4.5	dBm
Difference in Launch Power between any Two Lanes (OMA)	P _{tx,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
RIN _{20OMA}	RIN			-130	dB/Hz
Optical Return Loss Tolerance	TOL			20	dB
Transmitter Reflectance	R _T			-12	dB
Average Launch Power OFF Transmitter, each Lane	P _{off}			-30	dBm
Eye Mask {X1, X2, X3, Y1, Y2, Y3}		{0.25,0.4,0.45,0.25,0.28,0.4}			

Note:

1. The minimum average launch power spec is based on ER not exceeding 9.5dB and transmitter OMA higher than 0.1dBm.
2. Even if the TDP < 0.75dB, the OMA min must exceed the minimum value specified here.

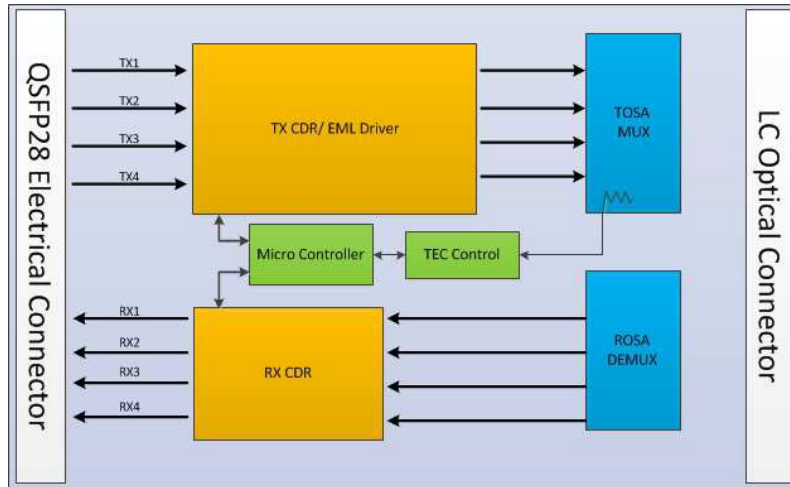
Optical – Receiver

Parameter	Symbol	Min	Typical	Max	Unit
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
Damage Threshold, each Lane ³	TH _d	-3.0			dBm
Average Receive Power, each Lane ⁴		-16.9		-4.9	dBm
Average Receive Power, each Lane ⁵		-20.9		-4.9	dBm
Receive Power (OMA), each Lane				-1.9	dBm
Receiver Sensitivity (OMA), each Lane (for BER=1x10 ⁻¹²)	SEN1			-14.65	dBm
Stressed Receiver Sensitivity (OMA), each Lane (for BER=1x10 ⁻¹²)				-12.65	dBm
Receiver Sensitivity (OMA), each Lane (for BER=5x10 ⁻⁵)	SEN2			-18.65	dBm
Stressed Receiver Sensitivity (OMA), each Lane (for BER=5x10 ⁻⁵)				-16.65	dBm
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 3dB upper Cutoff Frequency, each Lane	F _c			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

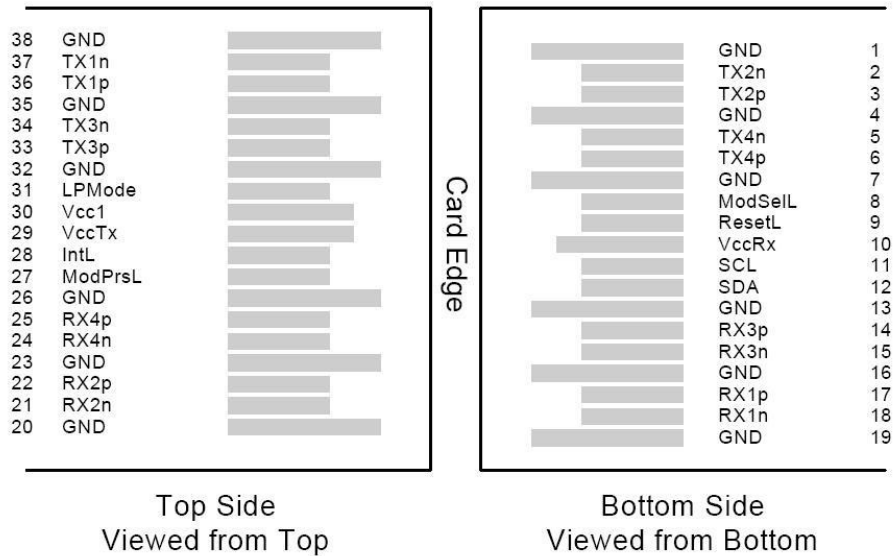
Note:

3. 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.
4. For link distance 30km.
5. For link distance 40km.
6. 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.

Block Diagram



Electrical Connector Layout



Electrical Pin Definition

Pin	Logic	Symbol	Name/Description
1		GND	Module Ground ¹
2	CML-I	Tx2-	Transmitter inverted data input
3	CML-I	Tx2+	Transmitter non-inverted data input
4		GND	Module Ground ¹

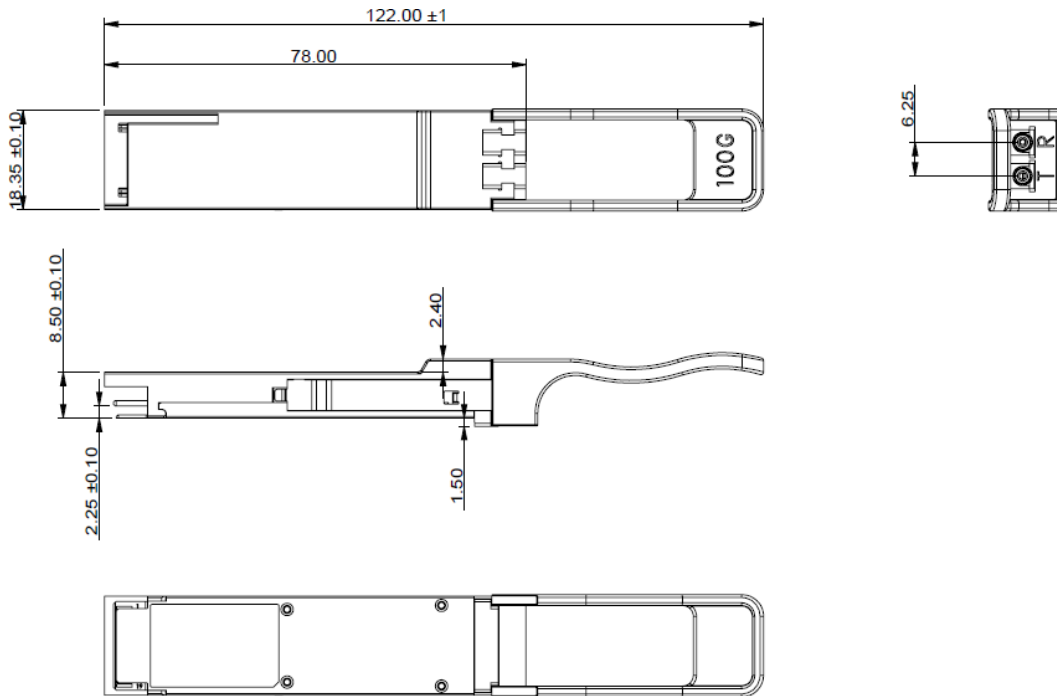
5	CML-I	Tx4-	Transmitter inverted data input
6	CML-I	Tx4+	Transmitter non-inverted data input
7		GND	Module Ground ¹
8	LVTTL-I	MODSEIL	Module Select
9	LVTTL-I	ResetL	Module Reset
10		VCCRx	+3.3V Receiver Power Supply ²
11	LVC MOS-I	SCL	2-wire Serial interface clock
12	LVC MOS-I/O	SDA	2-wire Serial interface data
13		GND	Module Ground
14	CML-O	RX3+	Receiver non-inverted data output
15	CML-O	RX3-	Receiver inverted data output
16		GND	Module Ground ¹
17	CML-O	RX1+	Receiver non-inverted data output
18	CML-O	RX1-	Receiver inverted data output
19		GND	Module Ground ¹
20		GND	Module Ground ¹
21	CML-O	RX2-	Receiver inverted data output
22	CML-O	RX2+	Receiver non-inverted data output
23		GND	Module Ground ¹
24	CML-O	RX4-	Receiver inverted data output ¹
25	CML-O	RX4+	Receiver non-inverted data output
26		GND	Module Ground ¹
27	LVTTL-O	ModPrsL	Module Present, internal pulled down to GND
28	LVTTL-O	IntL	Interrupt output, should be pulled up on host board
29		VCCTx	+3.3V Transmitter Power Supply ²
30		VCC1	+3.3V Power Supply ²
31	LVTTL-I	LPMODE	Low Power Mode
32		GND	Module Ground ¹
33	CML-I	Tx3+	Transmitter non-inverted data input
34	CML-I	Tx3-	Transmitter inverted data input
35		GND	Module Ground ¹
36	CML-I	Tx1+	Transmitter non-inverted data input
37	CML-I	Tx1-	Transmitter inverted data input
38		GND	Module Ground ¹

Note:

1. GND is the symbol for signal and supply (power) common for the QSFP28 modules. 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. They all may be internally connected within the module in any combination. The connector pins are each rated for a maximum current of 1000mA.

Mechanical Dimensions

Note: All units are in mm



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