

QSFP28 100G LR4 Optical Transceiver

Product Features

- Hot pluggable QSFP28 MSA form factor
- Compliant to IEEE 802.3ba 100GBASE-LR4
- 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 TOSA (1295.56, 1300.05, 1304.58, 1309.14nm)
- Receiver: 4x25Gb/s PIN ROSA
- 4x28G Electrical Serial Interface (CEI-28G-VSR)
- Maximum power consumption 3.5W
- Duplex LC receptacle
- RoHS-6 compliant

Applications

- 100GBASE-LR4 Ethernet Links
- Infiniband QDR and DDR interconnects
- Client-side 100G Telecom connections

Operating Condition

Parameter	Unit	Min.	Typical	Max.
Storage Temperature	°C	-40		85
Operating Case Temp for C-temp	°C	0		70
Power Supply Voltage	V	3.15	3.3	3.45
Power Consumption	W			3.5
Damage Threshold, each Lane	dBm	5.5		

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		10	km	Link Distance with G.652

Electrical Characteristics

Parameter	Test Point	Unit	Min	Typical	Max	Notes
Power Consumption		W			3.5	
Supply Current	Icc	A			1.12	
Transceiver Power-on Initialization Time		ms			2000	1
Single-ended Input Voltage Tolerance (Note 2)		V	-0.3		4	Referred to TP1 signal common
AC Common Mode Input Voltage Tolerance		mV	15			RMS
Differential Input Voltage Swing Threshold		mVpp	50			LOSA Threshold
Differential Input Voltage Swing	Vin,pp	mVpp	190		700	
Differential Input Impedance	Zin	Ohm	90	100	110	
Single-ended Output Voltage		V	-0.3		4	Referred to signal common
AC Common Mode Output Voltage		mV			7.5	RMS
Differential Output Voltage Swing	Vout,pp	mVpp	300		850	
Differential Output Impedance	Zout	Ohm	90	100	110	

Notes: 1. Power-on Initialization Time is the time from when the power supply voltages reach and remain above the minimum recommended operating supply voltages to the time when the module is fully functional.
 2. The single ended input voltage tolerance is the allowable range of the instantaneous input signals.

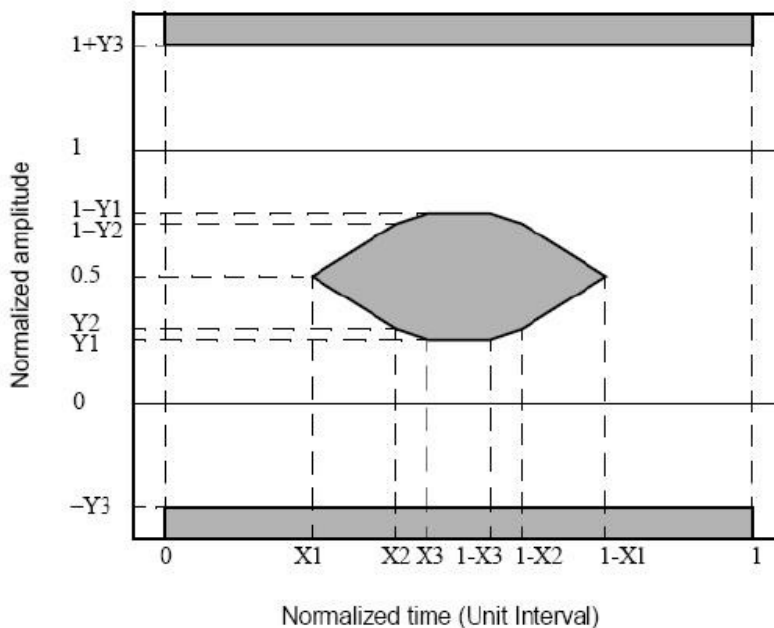
Optical Characteristics

Parameter	Symbol	Unit	Min	Typical	Max	Notes
Wavelength Assignment	L0	nm	1294.53	1295.56	1296.59	
	L1	nm	1299.02	1300.05	1301.09	
	L2	nm	1303.54	1304.58	1305.63	
	L3	nm	1308.09	1309.14	1310.19	
Transmitter						
Side Mode Suppression Ratio	SMSR	dB	30			
Total Average Launch Power	PT	dBm			10.5	
Average Launch Power, each Lane	PAVG	dBm	-4.3		4.5	
OMA, each Lane	POMA	dBm	-1.3		4.5	1
Difference in Launch Power between any Two Lanes (OMA)	Ptx,diff	dB			5	
Launch Power in OMA minus Transmitter and Dispersion Penalty (TDP), each Lane		dBm	-2.3			
TDP, each Lane	TDP	dB			2.2	
Extinction Ratio	ER	dB	4			
Relative Intensity Noise	RIN	dB/Hz			-130	
Optical Return Loss Tolerance	TOL	dB			20	
Transmitter Reflectance	RT	dB			-12	
Eye Mask{X1, X2, X3, Y1, Y2, Y3}			{0.25, 0.4,0.45, 0.25,0.28, 0.4}		2	
Average Launch Power OFF Transmitter, each Lane	Poff	dBm			-30	
Receiver						
Damage Threshold, each Lane	THd	dBm	5.5			3
Total Average Receive Power		dBm			10.5	
Average Receive Power, each Lane		dBm	-10.6		4.5	
Receive Power (OMA), each Lane		dBm			4.5	
Receiver Sensitivity (OMA), each Lane	SEN	dBm			-8.6	
Stressed Receiver Sensitivity (OMA),each Lane		dBm			-6.8	4
Receiver Reflectance	RR	dB			-26	
Difference in Receive Power between any Two Lanes (OMA)	Prx,diff	dB			5.5	
LOS Assert	LOSA	dBm	-24		-13.6	
LOS Deassert	LOSD	dBm			-11.6	
LOS Hysteresis	LOSH	dB		1.5		

Receiver Electrical 3 dB upper Cutoff Frequency, each Lane	Fc	GHz			31	
Conditions of Stress Receiver Sensitivity Test (Note 5)						
Vertical Eye Closure Penalty, each Lane		dB		1.8		
Stressed Eye J2 Jitter, each Lane		UI		0.3		
Stressed Eye J9 Jitter, each Lane		UI		0.47		

Notes:

1. Even if the TDP < 1 dB, the OMA min must exceed the minimum value specified here.
2. See Figure 1 below.
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. Measured with conformance test signal at receiver input for BER = 1x10⁻¹².
5. Vertical eye closure penalty and stressed eye jitter are test conditions for measuring stressed receiver sensitivity. They are not characteristics of the receiver.



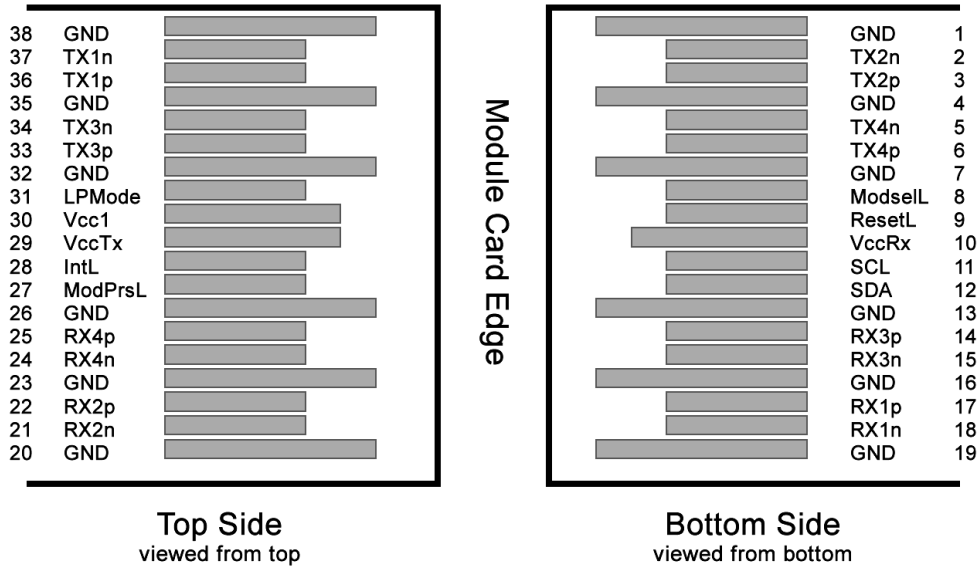
Digital Diagnostic Functions

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

Parameter	Symbol	Unit	Min	Max	Notes
Temperature monitor absolute error	DMI_Temp	degC	-3	3	Over operating temp
Supply voltage monitor absolute error	DMI_VCC	V	-0.1	0.1	Full operating range
Channel RX power monitor absolute error	DMI_RX	dB	-3	3	Per channel
Channel Bias current monitor	DMI_Ibias	mA	-10%	10%	Per channel
Channel TX power monitor absolute error	DMI_TX	dB	-3	3	Per channel

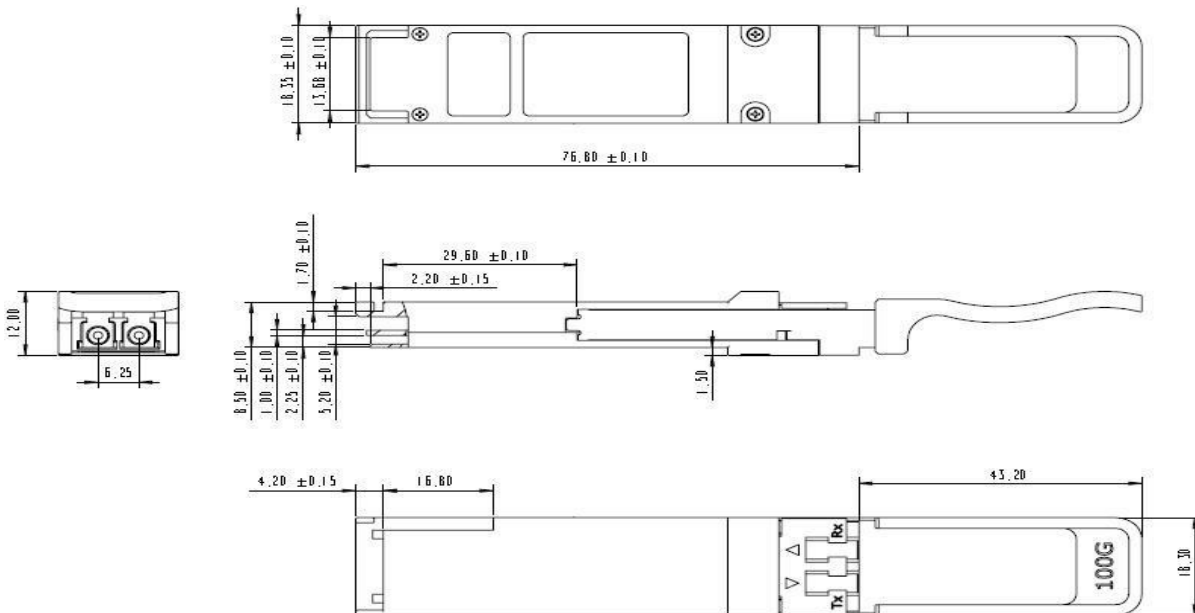
PIN Definition

Pin No.	Symbol	Level / Logic	Description
1	GND		Module Ground
2	Tx2n	CML-I	Transmitter Inverted Data Input
3	Tx2p	CML-I	Transmitter Non-Inverted Data Input
4	GND		Module Ground
5	Tx4n	CML-I	Transmitter Inverted Data Input
6	Tx4p	CML-I	Transmitter Non-Inverted Data Input
7	GND		Module Ground
8	ModSelL	LVTTTL-I	Module Select
9	ResetL	LVTTTL-I	Module Reset
10	VccRx		+3.3V Power Supply for Receiver
11	SCL	LVTTTL-I	2-Wire Serial Interface Clock
12	SDA	LVTTTL-I/O	2-Wire Serial Interface Data Line
13	GND		Module Ground
14	Rx3p	CML-O	Receiver Non-Inverted Data Output
15	Rx3n	CML-O	Receiver Inverted Data Output
16	GND		Module Ground
17	Rx1p	CML-O	Receiver Non-Inverted Data Output
18	Rx1n	CML-O	Receiver Inverted Data Output
19	GND		Module Ground
20	GND		Module Ground
21	Rx2n	CML-O	Receiver Inverted Data Output
22	Rx2p	CML-O	Receiver Non-Inverted Data Output
23	GND		Module Ground
24	Rx4n	CML-O	Receiver Inverted Data Output
25	Rx4p	CML-O	Receiver Non-Inverted Data Output
26	GND		Module Ground
27	ModPrsL	LVTTTL-O	Module Present
28	IntL	LVTTTL-O	Interrupt
29	VccTx		+3.3V Power Supply for Transmitter
30	Vcc1		+3.3V Power Supply
31	LPMODE	LVTTTL-I	Low Power Mode
32	GND		Module Ground
33	Tx3p	CML-I	Transmitter Non-Inverted Data Input
34	Tx3n	CML-I	Transmitter Inverted Data Input
35	GND		Module Ground
36	Tx1p	CML-I	Transmitter Non-Inverted Data Input
37	Tx1n	CML-I	Transmitter Inverted Data Input
38	GND		Module Ground



OUTLINES

The mechanical dimensions of this QSFP28 module meets the package outline defined in QSFP+ SFF-8661 Rev 2.3 specification.



ESD

This transceiver is specified as ESD threshold 1kV for SFI 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.

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).

Ordering Information

Ordering P/Ns	Description
D1TThh-QLCA	10km LAN-WDM QSFP28 100G LR4 Transceiver, LC/UPC optical interface, commercial temperature

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