

QSFP28-LR4-100G

TransOpto

QSFP28, 100GbE-LR4, (4x 25.8 Gbps), 10km 1310nm, 6.3dB, SM

DESCRIPTIONS

QSFP28-LR4-100G is a 4x25G single mode fiber, hot pluggable optical transceiver. With the unique System On Glass™ (SOGTM) technology enables the integration of 4 transmitters, 4 receivers and an optical MUX/ De MUX into a small form factor package that delivers up to 112 Gbps data link in a compact QSFP28 footprint.



FEATURES

- Compliant with the QSFP28 MSA Technical Specifications.
- Supports operation for a data rate of 103.1Gb/s.
- Maximum link length of 10km on Single Mode Fiber (SMF)
- Optical specifications are compliant with IEEE802.3ba 100GBASE-LR4.
- Low speed electrical signal is compliant with SFF-8679
- High speed electrical signal is compliant with 802.3bm CAUI-4
- Digital diagnostic functions are available via the I2C interface, as specified by SFF-8636
- 4x25Gb/s DFB-based LAN-WDM transmitter with central wavelengths of 4 channels 1295.56, 1300.05, 1304.58 and 1309.14 nm
- Supports operation for a case temperature of 0°C to +70°C

- Duplex LC receptacles
- Power Dissipation < 4W
- Single 3.3V Power Supply
- ROHS Compliant.

APPLICATIONS

- 100GBASE-LR4 Ethernet links.

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The optical connectivity is based on two Single mode Fiber (SMF) LC connectors, one for Tx and one for Rx. The Tx and Rx each consist of 4 25GB/s LAN-WDM channels, whose wavelengths are in the 1300nm range.

The QSFP28 LR4 transceiver is designed for applications with a reach up to 10Km.

This transceiver is based on a proprietary PLC technology, using surface mounted opto-electronic devices with no free space elements. The unique design of the optical engine facilitates unparalleled compactness while maintaining Telcordia robustness.

ABSOLUTE MAXIMUM RATINGS

Parameter	Symbol	Min.	Max.	Unit
Storage Temperature	TSTG	-40	+85	°C
Supply Voltage	VCC	0	4	V
Maximum Average Input Optical Power per Lane (Damage Threshold)	PIN	5.5		dBm
Relative Humidity	RH	10% to 90% condensing		

RECOMMENDED OPERATING ENVIRONMENT

Parameter	Symbol	Min.	Max.	Unit
Case Temperature-Operating	TCASE	0	70	°C
Supply Voltage	VCC	3.14	3.46	V
Power Consumption	PDISS		3.5	W
Power Consumption-LP Mode	PDISS-lp		1.5	W

ELECTRICAL CHARACTERISTICS

Transmitter electrical input signal characteristics (TP1)	Min	Typ	Max	Unit
Signaling rate per lane (range)	25.78125 ± 100 ppm			GBd
Differential input return loss	Equation (83E-5)			dB
Differential to common mode input return loss	Equation (83E-6)			dB
Differential termination mismatch			10	%
Module stressed input test	See 83E3.4.1			
Differential pk-pk input voltage tolerance	900			mV
DC common mode voltage	-350		2850	mV
Single ended voltage tolerance range	-0.4		3.3	V
Receiver electrical output signal characteristics (TP4)	Min	Typ	Max	Unit
Signaling rate per lane (range)	25.78125 ± 100 ppm			GBd
AC common-mode output voltage (RMS)			17.5	mV
Differential output voltage			900	mV
Eye width	0.57			UI
Eye height, differential	228			mV
Vertical eye closure			5.5	dB
Differential output return loss	Equation (83E-2)			dB
Common to differential mode conversion return loss	Equation (83E-3)			dB
Differential termination mismatch			10	%
Transition time (20% to 80%)	12			ps
DC common mode voltage	-350		2850	mV

100GBASE-LR4 OPERATION

Transmitter Parameter	Lane	Min.	Typ	Max.	Unit	Notes
Signaling rate, each lane		25.78125 ± 100 j		jpm	Gb/s	
Lane Wavelength Range	Lane0	1294.53	/	1296.59	nm	
	Lane1	1299.02	/	1301.09	nm	
	Lane2	1303.54	/	1305.63	nm	
	Lane3	1308.09	/	1310.19	nm	
Average Optical Power lane		-4.3		4.5	dBm	
Total Average Launch Power				10.5	dBm	
Optical Modulation Amplitude (OMA), each Lane		-1.3		4.5	dBm	
Launch Power in OMA minus TDP, each lane		-2.3			dBm	
Transmitter and Dispersion Penalty (DP), each lane				2.2	dB	
Average Launch Power per Lane @ TX Off State				-30	dBm	
Extinction Ratio		4			dB	
Relative Intensity Noise (OMA)				-130	dB/Hz	
Side-Mode Suppression Ratio (SMSR)		30			dB	
Optical Return Loss Tolerance				20	dB	
Transmitter Reflectance				-12	dB	

Notes:

1. Hit ratio 5x10⁵
2. Measured with a test pattern of PRBS 231-1 at Pre-fec BER 1x10⁻¹²
3. Measured with vertical eye closure penalty of 1.8 dB max, J₂ of 0.30 UI? and J₉ of 0.47 UI.

OTU4 411-9D1F OPERATION

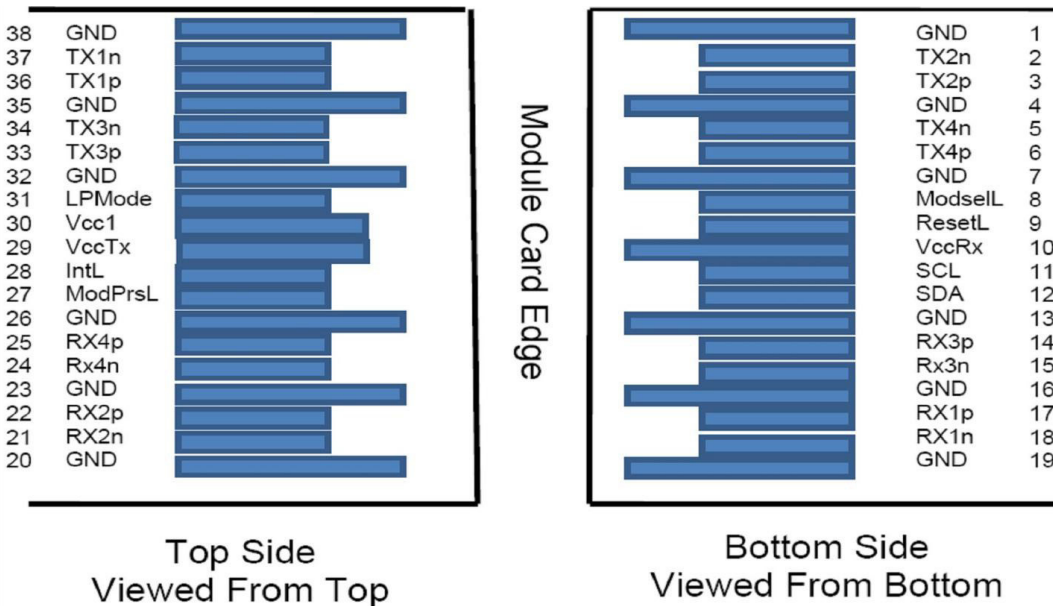
Parameter	Lane	Min.	Typ	Max.	Unit	Notes
Signaling rate, each lane		27.9525 ± 20 ppm			Gb/s	
Lane Wavelength Range	Lane0	1294.53	/	1296.59	nm	
	Lane1	1299.02	/	1301.09	nm	
	Lane2	1303.54	/	1305.63	nm	
	Lane3	1308.09	/	1310.19	nm	
Average Optical Power per Channel		-0.6		4	dBm	
Total Average Launch Power				10	dBm	
Channel power difference				5	dB	
Extinction Ratio		4		7	dB	
Optical Return Loss				20	dB	
Transmitter Output Power Monitoring Accuracy		-3		3	dB	
Transmitter Eye Mask Definition {X1, X2, X3, Y1, Y2Z Y3}	(0.25, 0.4, 0.45, 0.25, 0.28, 0.4)					1
Receiver Parameter	Lane	Min.	Typ	Max.	Unit	Notes
Signaling rate, each lane		27.9525 ± 20 ppm			Gb/s	
Lane Wavelength Range	Lane0	1294.53	/	1296.59	nm	
	Lane1	1299.02	/	1301.09	nm	
	Lane2	1303.54	/	1305.63	nm	
	Lane3	1308.09	/	1310.19	nm	
Average Input Power per Channel		-6.9		4.0	dBm	
Total Average Input Power				10.0	dBm	
Optical Path penalty				1.5	dB	
Channel Power Difference				5.5	dB	
Receiver Reflectance				-26.0	dB	
Equivalent Sensitivity per Channel				-8.4	dBm	
Receive Power Monitor Accuracy		-3.0		3.0	dB	

Notes:

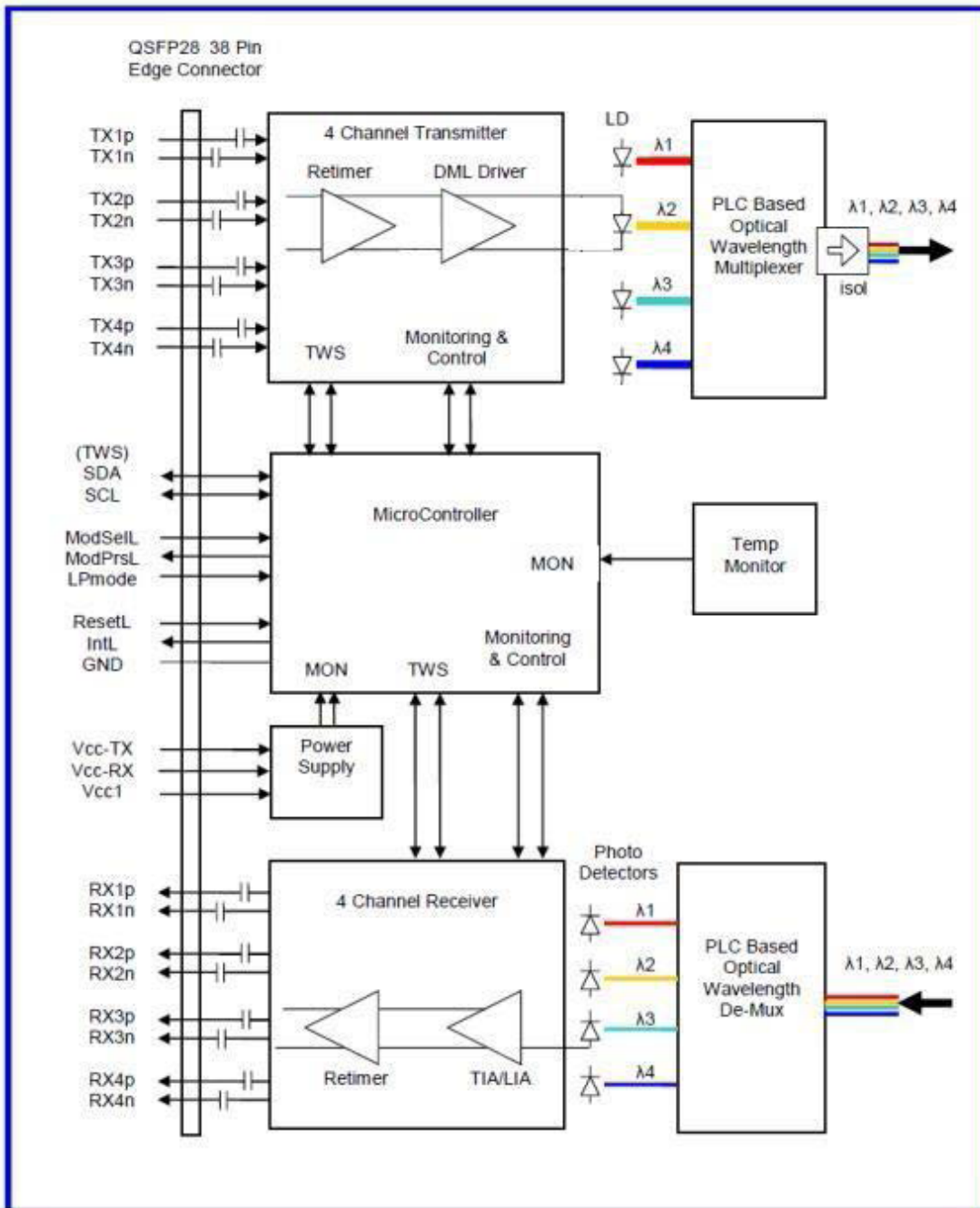
1. Hit ratio 5x10⁻⁵
2. Measured with a test pattern of PRBS 231-1 at Pre-fec BER 1x10⁻⁶

PIN DESCRIPTION

The electrical interface to the transceiver is a 38 pins edge connector. The 38 pins provide high speed data, low speed monitoring and control signals, I2C communication, power and ground connectivity. The top and bottom views of the connector are provided below, as well as a table outlining the contact numbering, symbol and full description.



FUNCTIONAL BLOCK DIAGRAM



QSFP TRANSCEIVER PINOUT

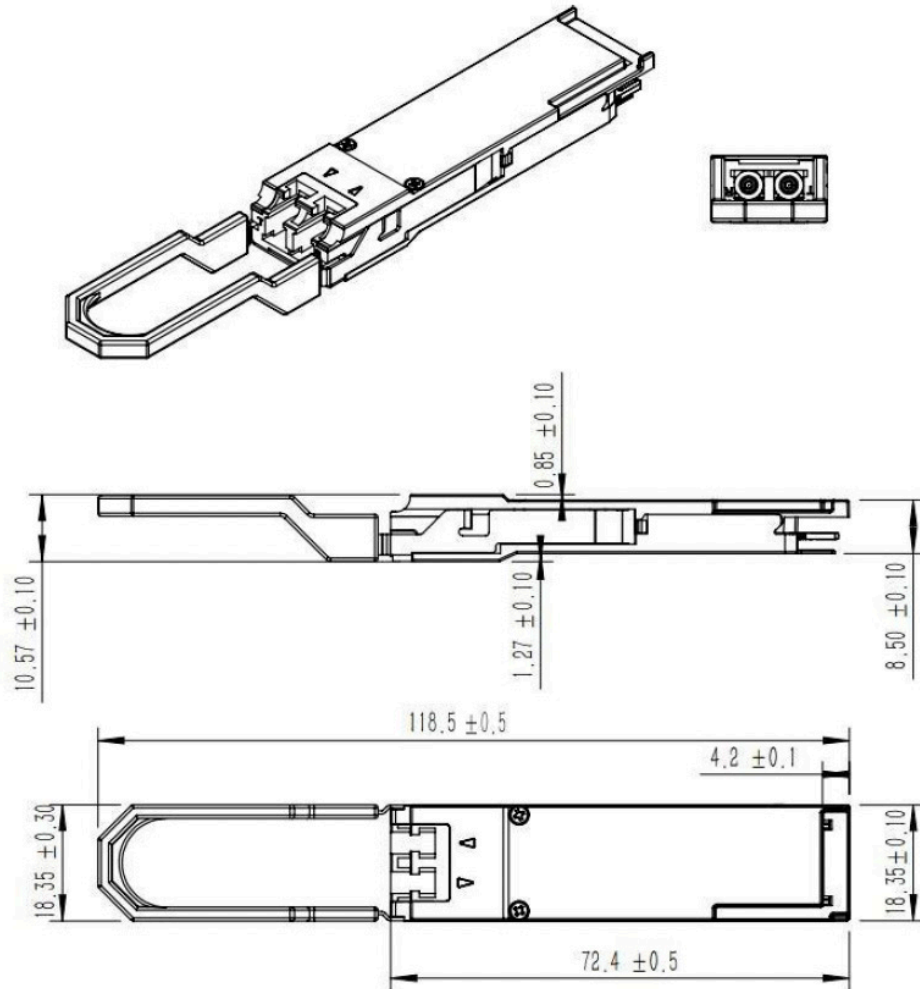
Pin	Logic	Symbol	Name/Description	Plug seg	Notes
1		GND	Ground	1	1
2	CML-I	Tx2n	Transmitter Inverted Data Input	3	
3	CML-I	Tx2p	Transmitter Non-Inverted Data Output	3	
4		GND	Ground	1	1
5	CML-I	Tx4n	Transmitter Inverted Data Output	3	
6	CML-I	Tx4p	Transmitter Non-Inverted Data Output	3	
7		GND	Ground	1	1
8	LVTTLL-I	ModSelL	Module Select	3	
9	LVTTLL-I	ResetL	Module Reset	3	
10		VccRx	+3.3V Power Supply Receiver	2	2
11	LVC-MOS-I/O	SCL	2-Wire Serial Interface Clock	3	
12	LVC-MOS-I/O	SDA	2-Wire Serial Interface Data	3	
13		GND	Ground	1	
14	CML-O	Rx3p	Receiver Non-Inverted Data Output	3	
15	CML-O	Rx3n	Receiver Inverted Data Output	3	
16		GND	Ground	1	1
17	CML-O	Rx1p	Receiver Non-Inverted Data Output	3	
18	CML-O	Rx1n	Receiver Inverted Data Output	3	
19		GND	Ground	1	1
20		GND	Ground	1	1
21	CML-O	Rx2n	Receiver Inverted Data Output	3	
22	CML-O	Rx2p	Receiver Non-Inverted Data Output	3	
23		GND	Ground	1	1
24	CML-O	Rx4n	Receiver Inverted Data Output	3	
25	CML-O	Rx4p	Receiver Non-Inverted Data Output	3	
26		GND	Ground	1	1
27	LVTTLL-O	ModPrsL	Module Present	3	
28	LVTTLL-O	IntL/Rx Los	Interrupt / Rx los output	3	
29		VccTx	+3.3V Power Supply Transmitter	2	2
30		Vcc1	+3.3V Power Supply	2	2

Pin	Logic	Symbol	Name/Description	Plug seg	Notes
31	LVTTLL-I	LPMMode/Tx dis	Low Power Mode / Tx disable input	3	
32		GND	Ground	1	1
33	CML-I	Tx3p	Transmitter Non-Inverted Data Output	3	
34	CML-I	Tx3n	Transmitter Inverted Data Output	3	
35		GND	Ground	1	1
36	CML-I	Tx1p	Transmitter Non-Inverted Data Output	3	
37	CML-I	Tx1n	Transmitter Inverted Data Output	3	
38		GND	Ground	1	1

Notes:

1. GND is the symbol for signal and supply (power) common for the QSFP28 module. All are common within the QSFP28 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. Vcc Rx, Vcc1 and Vcc Tx are the receiver and transmitter power supplies and shall be applied concurrently. Requirements defined for the host side of the Host Edge Card Connector are listed in MSA. The connector pins are each rated for a maximum current of 1000 mA.

MECHANICAL SPECIFICATIONS



ORDERING INFORMATION

Part Number	Product Description
QSFP28-LR4-100G	QSFP28, 100GbE-LR4, 4x25.8 Gbps, 10km 1310nm, 6,3dB, SM

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