

100G QSFP28 LR4 10km Transceiver

Features

- Hot-pluggable QSFP28 MSA form factor
- Transmitter: cooled 4x28 Gb/s LAN WDM TOSA (1295.56, 1300.05, 1304.58, 1309.14nm)
- Receiver: 4x28 Gb/s PIN ROSA
- Up to 10 km reach for G.652 SMF
- Single +3.3 V power supply
- Power dissipation < 3.5 W
- Duplex LC receptacle
- Digital diagnostics function is available via the I2C interface
- Case temperature range: Industrial: 0 °C to 70 °C

Applications

- 100GBASE-LR4 Ethernet Links
- Infiniband QDR and DDR interconnects
- Client-side 100G Telecom connections
- OTU4 rate connections

Standards

- Complies with IEEE 802.3ba, IEEE 802.3bm and 100G LR4
- SFF-8436 QSFP+
- SFF-8665
- SFF-8636
- Compliant with CEI-28G-VSR
- RoHS-6 compliant

Absolute Maximum Ratings

Parameter	Symbol	Min.	Max.	Unit	Note
Supply Voltage	V _{cc}	-0.5	3.6	V	
Storage Temperature	T _s	-40	85	°C	
Relative Humidity	RH	0	85	%	

Recommended Operating Conditions

Parameter	Symbol	Min.	Typ.	Max.	Unit	Note
Operating Case Temperature	T _c	0		70	°C	
Power Supply Voltage	V _{cc}	3.13	3.3	3.47	V	
Power Supply Current	I _{cc}			1.12	A	

Transmitter Optical Characteristics

Parameter	Symbol	Min.	Typ.	Max.	Unit	Note
Data Rate each Lane	BR		25.78	27.95	Gb/s	
Lane Wavelength	λ ₀	1294.53	1295.56	1296.59	nm	
	λ ₁	1299.02	1300.05	1301.09	nm	
	λ ₂	1303.54	1304.58	1305.63	nm	
	λ ₃	1308.09	1309.14	1310.19	nm	
Side Mode Suppression Ratio	SMSR	30			dB	
Total Average Launch Power	P _{avg_total}			+10.5	dBm	
Average Launch Power each Lane	P _{avg}	-4.3		+4.5	dBm	
Optical modulation amplitude, each lane (OMA)	OMA	-1.3		+4.5	dBm	
Extinction Ratio	ER	4			dB	
Transmitter reflectance	TR			-12	dB	
Launch Power in OMA minus Transmitter and Dispersion		-2.3			dBm	

Penalty (TDP), each Lane						
TDP, each Lane	TDP			2.2	dB	
Average Launch Power off each Lane	Poff			-30	dBm	
Difference in launch power between any two lanes (OMA)	DT_OMA			5	dB	
Optical Return Loss Tolerance	-			20	dB	
Relative Intensity Noise	RIN			-130	dB/Hz	
Transmitter Eye Mask Definition {X1, X2, X3, Y1, Y2, Y3}	-	{0.25, 0.4, 0.45, 0.25, 0.28, 0.4}				1

Note1. See Figure 1 below.

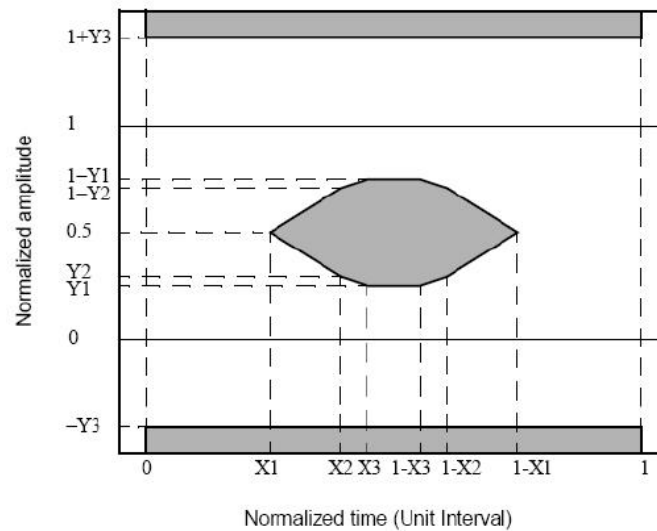


Figure1. Eye Mask Definition

Receiver Optical Characteristics

Parameter	Symbol	Min.	Typ.	Max.	Unit	Note
Data Rate each Lane	BR		25.78	27.95	Gb/s	
Damage Threshold, each Lane	THd	5.5			dBm	1
Total Average Receive Power				10.5	dBm	
Average Receive Power for each Lane	P_{in}	-10.6		4.5	dBm	
Receiver sensitivity (OMA), each lane	P_{sens1}			-8.6	dBm	2
Stressed Receiver Sensitivity in OMA (Each Lane)				-6.8	dBm	2
Overload Input Optical Power	P_{max}			4.5	dBm	
LOS De-Assert	LOSD			-13	dBm	
LOS Assert	LOSA	-24			dBm	
LOS Hysteresis	-	0.5	1.5	6	dB	
Receiver Reflectance	RR			-26	dB	
Receiver Electrical 3 dB upper Cutoff Frequency, each Lane	F_c			31	GHz	

Note:

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 a PRBS231-1 test pattern @25.78125Gbps, $BER \leq E-12$

Electrical Characteristics

Parameter	Symbol	Min.	Typ.	Max.	Unit	Note
Input Differential Impedance	Z_{IN}	90	100	110	Ω	
Data Input Swing Differential	V_{INPP}	200		900	mVpp	
Data Output Swing Differential	V_{OUTPP}	400		900	mVpp	
Control Input /output Voltage High	-	2.5		V_{cc}	V	
Control Input /output Voltage Low	-	0		0.8	V	

Pin-out Drawing

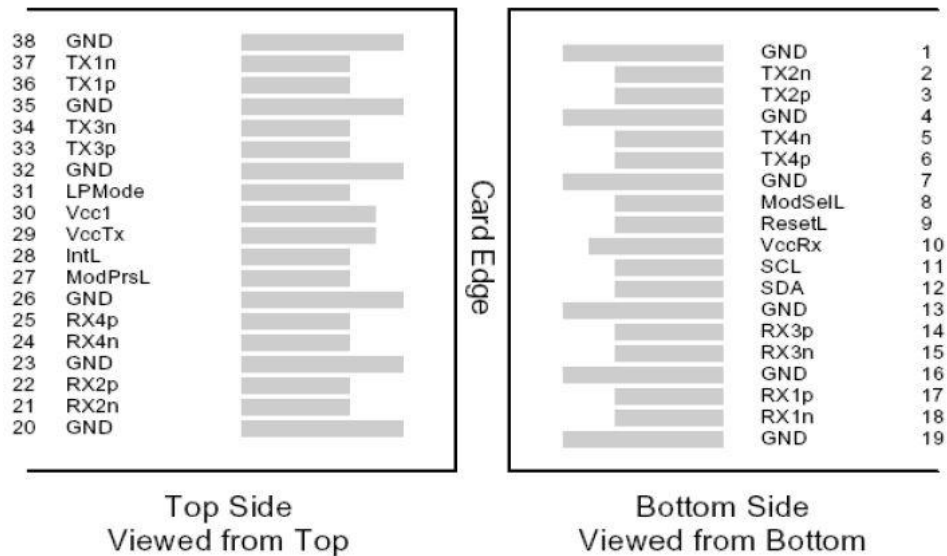


Figure 2. Pin-out Drawing

Pin Description

Pin	Logic	Symbol	Description	Note
1		GND	Ground	1
2	CML-I	Tx2n	Transmitter Inverted Data Input	
3	CML-I	Tx2p	Transmitter Non-Inverted Data Input	
4		GND	Ground	1
5	CML-I	Tx4n	Transmitter Inverted Data Input	
6	CML-I	Tx4p	Transmitter Non-Inverted Data Input	
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	1
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	
25	CML-O	Rx4p	Receiver Non-Inverted Data Output	
26		GND	Ground	1
27	LVTTL-O	Mod PrsL	Module Present	
28	LVTTL-O	IntL	Interrupt	
29		Vcc Tx	+3.3 V Power Supply transmitter	2
30		Vcc1	+3.3V Power Supply	2
31	LVTTL-I	LP Mode	Low Power Mode	
32		GND	Ground	1
33	CML-I	Tx3p	Transmitter Non-Inverted Data Input	
34	CML-I	Tx3n	Transmitter Inverted Data Input	
35		GND	Ground	1
36	CML-I	Tx1p	Transmitter Non-Inverted Data Input	
37	CML-I	Tx1n	Transmitter Inverted Data Input	
38		GND	Ground	1

Notes:

1. GND is the symbol for signal and supply (power) common for QSFP28 modules. 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 receiving and transmission power suppliers and shall be applied concurrently. Recommended host board power supply filtering is shown below. Vcc Rx, Vcc1 and Vcc Tx may be internally connected within the QSFP28 transceiver module in any combination. The connector pins are each rated for a maximum current of 500mA.

Package Outline

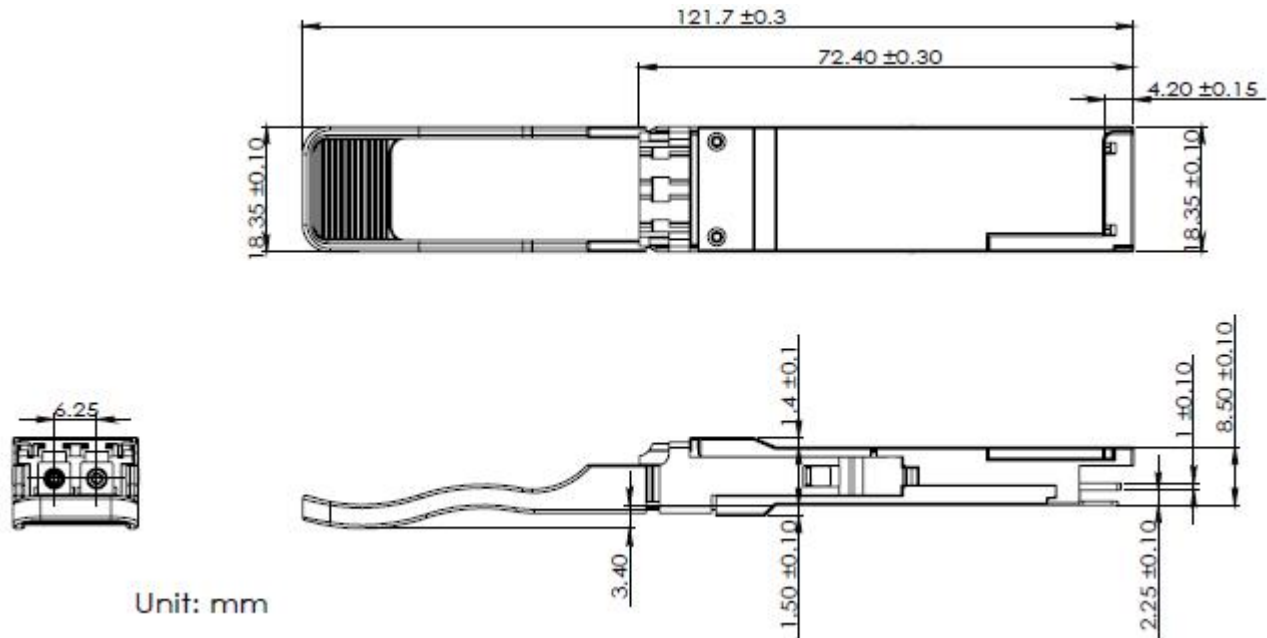


Figure 3. Package Outline

Digital Diagnostic Monitoring Interface

Parameter	Symbol	Accuracy	Calibration	Note
Temperature	DMI_Temp	$\pm 3^{\circ}\text{C}$	Internal	Over operating temp
Voltage	DMI_VCC	$\pm 0.1\text{V}$	Internal	Full operating range
Bias Current	DMI_BIAS	$\pm 10\%$	Internal	Per channel
TX Power	DMI_TX	$\pm 3\text{ dB}$	Internal	Per channel
RX Power	DMI_RX	$\pm 3\text{ dB}$	Internal	Per channel