

QSFP28-100G-LR4 - DML

Key Features

- Hot pluggable QSFP28 MSA form factor
- Compliant to IEEE 802.3ba 100GBASE-LR4
- Supports 103.1Gb/s aggregate bit rate
- Up to 10km reach for G.652 SMF
- Single +3.3V power supply
- Operating case temperature: 0~70C°
- Transmitter: cooled 4x25Gb/s LAN WDM DFB TOSA (1295.56, 1300.05, 1304.58, 1309.14nm)
- Receiver: 4x25Gb/s PIN ROSA
- 4x25G electrical interface (OIF CEI-28G-VSR)
- Maximum power consumption 4.0W
- Duplex LC receptacle
- RoHS-6 compliant

Applications

- 100GBASE-LR4 Ethernet Links
- Infiniband QDR and DDR interconnects
- Datacenter and Enterprise networking
- Industry/ Regulatory Compliance

MSA	QSFP28
Compliance	ESD: UL 60950, EN 60950-1:2006+A11+A1+A12+A2
	EMI: FCC 47 CFR Part 15 Oct 2013
	EMC CE: EN 5022:2010; EN 55024:2010
	Laser Eye Safety: FDA CDRH 1040.10 and 140.11 EN(IEC) 60825-1, 2 RoHS: 2011/65/EU

Ordering Information

Compatibility	ProLabs Part Number	Description
Arista	QSFP-100G-LR4-ARISTA-C	100GBASE-LR4 QSFP28, 1310nm, DML, 10km
Cisco	QSFP-100G-LR4-S-C	100GBASE-LR4 QSFP28, 1310nm, DML, 10km
F5	F5-UPG-QSFP28-LR4-C	100GBASE-LR4 QSFP28, 1310nm, DML, 10km
MSA Standard	QSFP28-100G-LR4-D-NC	100GBASE-LR4 QSFP28, 1310nm, DML, 10km
Juniper	JNP-100GBASE-LR4-C	100GBASE-LR4 QSFP28, 1310nm, DML, 10km
Dell	QSFP-100G-LR4-C	100GBASE-LR4 QSFP28, 1310nm, DML, 10km
Mellanox	MMA1L10-CR-C	100GBASE-LR4 QSFP28, 1310nm, DML, 10km



Specifications

Absolute Maximum Ratings					
Parameter	Symbol	Min	Max	Units	Notes
Storage Temperature	Tx	-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	5.5		dBm	

*Operation in excess of any individual absolute maximum ratings might cause permanent damage to this module.

Recommended Operating Conditions and Power Supply Requirements					
Parameter	Symbol	Min	Typical	Max	Units
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	D	0.002		10	km

Optical Characteristics						
Parameter	Symbol	Min	Typical	Max	Unit	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	P _T			10.5	dBm	
Average Launch Power, each Lane	P _{AVG}	-4.3		4.5	dBm	
OMA, each Lane	P _{OMA}	-1.3		4.5	dBm	1
Difference in Launch Power between any Two Lanes (OMA)	P _{tx,diff}			5.0	dB	
Launch Power in OMA minus Transmitter and Dispersion Penalty (TDP), each Lane		-2.3			dBm	
TDP, each Lane	TDP			2.2	dB	
Extinction Ratio	ER	4			dB	
RIN _{20OMA}	RIN			-130	dB/Hz	

Optical Return Loss Tolerance	TOL	20	dB	
Transmitter Reflectance	R _T	-12	dB	
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	P _{off}	-30	dBm	
Receiver				
Damage Threshold, each Lane	TH _d	5.5	dBm	3
Average Receive Power, each Lane		-10.6	4.5	dBm
Receive Power (OMA), each Lane			4.5	dBm
Receiver Sensitivity (OMA), each Lane	SEN	-8.6	dBm	
Stressed Receiver Sensitivity (OMA), each Lane		-6.8	dBm	4
Receiver reflectance		-26	dB	
Difference in Receive Power between any Two Lanes (Average and OMA)	Prx,diff	5.5	dB	
LOS Assert	LOSA	-30	dBm	
LOS Deassert	LOSD	-13	dBm	
LOS Hysteresis	LOSH	0.5	dB	
Receiver Electrical 3 dB upper Cutoff Frequency, each Lane	F _c	31	GHz	
Conditions of Stress Receiver Sensitivity Test (Note 5)				
Vertical Eye Closure Penalty, each Lane		1.8	dB	
Stressed Eye J2 Jitter, each Lane		0.3	UI	
Stressed Eye J9 Jitter, each Lane		0.47	UI	

Notes:

1. Even if the TDP < 1 dB, the OMA min must exceed the minimum value specified here.
2. See Figure 4 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 for BER = 10⁻¹².
5. Vertical eye closure penalty and stressed eye jitter are test conditions for measuring stressed receiver sensitivity. They are not characteristics of the receiver.

Electrical Characteristics						
Parameter	Test point	Min	Typical	Max	Unit	Notes
Power Consumption				4.0	W	
Supply Current	Icc			1.21	A	
Transmitter (each Lane)						
Overload Differential Voltage pk-pk	TP1a	900			mV	
Common Mode Voltage (Vcm)	TP1	-350		2850	mV	2
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	2
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	3
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. 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. Vcm is generated by the host. Specification includes effects of ground offset voltage.
3. From 250MHz to 30GHz.

Mechanical Specifications

