

QSFP28 100GBASE-LR4 1310nm 10km Transceiver

QSFP28-LR4-100G



Application

- 100GBASE-LR4 100G Ethernet

Features

- Hot Pluggable QSFP28 form factor
- Supports 103.1Gb/s aggregate bit rate
- Compliant with IEEE 802.3ba 100GBASE-LR4
- Maximum link length of 10km on Single Mode Fiber (SMF)
- Single 3.3V power supply
- Maximum power consumption 3.5W
- LAN WDM DML laser and PIN Receiver Array
- QSFP28 MSA package with duplex LC connector
- Commercial operating case temperature range: 0° C to 70° C
- RoHS-6 compliant
- Class 1 Laser

Product Specifications

I. Absolute Maximum Ratings

Parameter	Symbol	Min	Typ.	Max	Unit	Ref.
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	5.5			dBm	

II. Recommended Operating Environment

Parameter	Symbol	Min	Typ.	Max	Unit	Ref.
Operating Case Temperature	T_{OP}	0		70	°C	
Power Supply Voltage	V_{CC}	3.135	3.3	3.465	V	
Data Rate, each Lane		25.78		27.95	Gb/s	
Control Input Voltage High		2		V_{CC}	V	
Control Input Voltage Low		0		0.8	V	
Link Distance with G.652	D	2		10000	m	

III. Electrical Characteristics (Defined over the Recommended Operating Environment)

Parameter	Symbol	Min	Typ.	Max	Unit	Ref.
Power Consumption				3.5	W	
Supply Current	I_{CC}			1.12	A	
Transmitter (each Lane)						
Differential Input Voltage Swing	$V_{in,pp}$			900	mVpp	
Differential Input Impedance	Z_{in}	90	100	110	Ohm	

Receiver (each Lane)

Differential Output Voltage Swing	$V_{out,pp}$	100	400	mVpp	1
		300	600		
		400	800		
		600	1200		

Differential Output Impedance	Z_{out}	90	100	110	Ohm	
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Notes:

1. Output voltage is settable in 4 discrete ranges via I2C. Default range is 400 – 800 mV.

IV. Electrical Characteristics (Defined over the Recommended Operating Environment)

Parameter	Symbol	Min	Typ.	Max	Unit	Ref.
Signaling Speed per Channel			25.78125		Gbps	
Lane Wavelength	L0	1294.53	/	1296.59	nm	
	L1	1299.02	/	1301.09	nm	
	L2	1303.54	/	1305.63	nm	
	L3	1308.09	/	1310.19	nm	
Transmitter						
Side Mode Suppression Ratio	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	
Difference in Launch Power between any Two Lanes (OMA)	$P_{tx,diff}$			5	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	
RIN₂₀OMA	RIN			-130	dB/Hz	

Optical Return Loss Tolerance	TOL		25.78125		Gbps	
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}			1
Average Launch Power OFF Transmitter, each Lane	P_{off}			-30	dBm	
Receiver						
Signaling Speed per Channel			25.78125		Gbps	
Lane Wavelength	L0	1294.53	/	1296.59	nm	
	L1	1299.02	/	1301.09	nm	
	L2	1303.54	/	1305.63	nm	
	L3	1308.09	/	1310.19	nm	
Total Average Receive Power				10.5	dBm	
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	2
Stressed Receiver Sensitivity (OMA), each Lane				-6.8	dBm	
Difference in Receive Power between any Two Lanes (OMA)	$P_{rx,diff}$			5.5	dB	
LOS Assert	LOSA	-25			dBm	
LOS De-assert	LOSD			-13	dBm	
LOS Hysteresis	LOSH	0.5		6	dB	

Notes:

1. Compliant to IEEE 802.3ba.
2. Measured with conformance test signal at receiver input for BER = 1×10^{-12} .

V. Digital Diagnostic Functions (Defined over the Recommended Operating Environment)

Parameter	Symbol	Min	Typ.	Max	Unit	Ref.
Temperature Monitor Absolute Error	DMI_Temp	-3		3	°C	Over operating temperature range
Supply Voltage Monitor Absolute Error	DMI_VCC	-3%		+3%	V	Over full operating range
Channel RX Power Monitor Absolute Error	DMI_RX_Ch	-2		2	dB	
Channel Bias Current Monitor	DMI_Ibias_Ch	-10%		10%	mA	Ch1~Ch4
Channel TX Power Monitor Absolute Error	DMI_TX_Ch	-2		2	dB	

VI. Pin Description

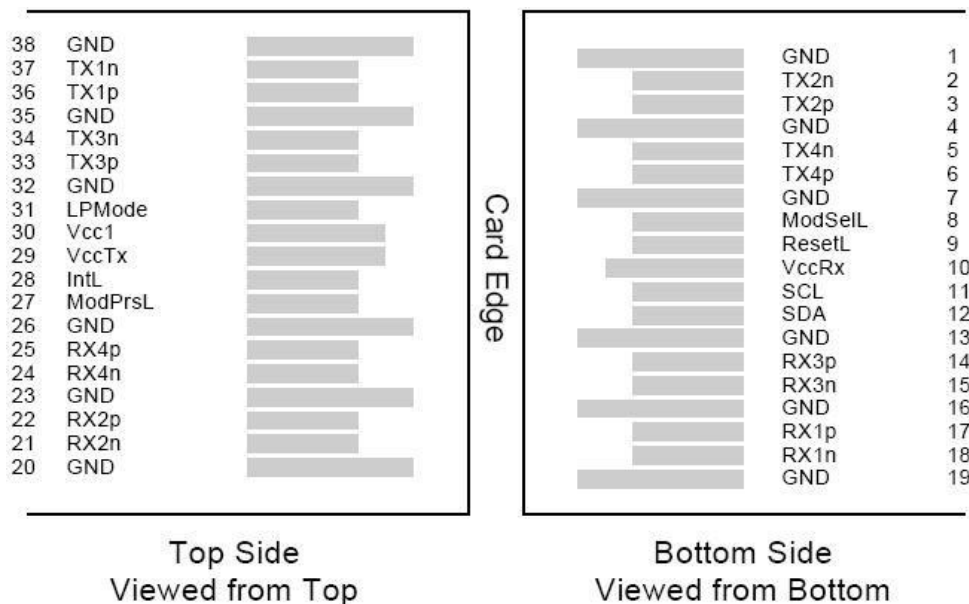


Figure 1 – QSFP+ MSA-Compliant 38-Pin Connector

Pin	Symbol	Name/Description	Ref.
1	GND	Ground	1
2	Tx2n	Transmitter Inverted Data Input	
3	Tx2p	Transmitter Non-Inverted Data Input	
4	GND	Ground	1
5	Tx4n	Transmitter Inverted Data Input	
6	Tx4p	Transmitter Non-Inverted Data Input	
7	GND	Ground	1
8	ModSelL	Module Select	
9	ResetL	Module Reset	
10	VccRx	+3.3 V Power Supply Receiver	2
11	SCL	2-Wire Serial Interface Clock	
12	SDA	2-Wire Serial Interface Data	
13	GND	Ground	
14	Rx3p	Receiver Non-Inverted Data Output	
15	Rx3n	Receiver Inverted Data Output	
16	GND	Ground	1
17	Rx1p	Receiver Non-Inverted Data Output	
18	Rx1n	Receiver Inverted Data Output	
19	GND	Ground	1
20	GND	Ground	1
21	Rx2n	Receiver Inverted Data Output	
22	Rx2p	Receiver Non-Inverted Data Output	
23	GND	Ground	1
24	Rx4n	Receiver Inverted Data Output	
25	Rx4p	Receiver Non-Inverted Data Output	
26	GND	Ground	1
27	ModPrsL	Module Present	

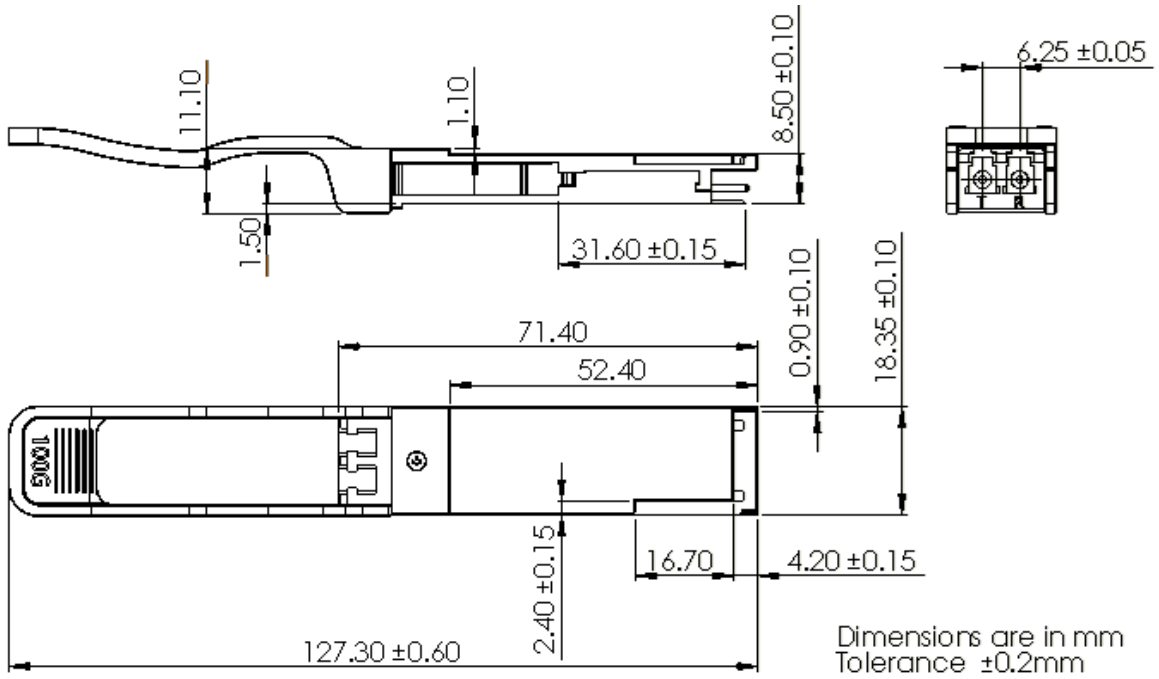
28	IntL	Interrupt	
29	VccTx	+3.3 V Power Supply Transmitter	2
30	Vcc1	+3.3 V Power Supply	2
31	LPMode	Low Power Mode	
32	GND	Ground	1
33	Tx3p	Transmitter Non-Inverted Data Input	
34	Tx3n	Transmitter Inverted Data Input	
35	GND	Ground	1
36	Tx1p	Transmitter Non-Inverted Data Input	
37	Tx1n	Transmitter 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.VccRx, Vcc1 and VccTx are the receiver and transmitter power suppliers and shall be applied concurrently. 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 1000mA.

VII. Mechanical Specifications

The mechanical specifications are compliant to the QSFP+ MSA transceiver module specifications.



Test Center

FS.COM transceivers are tested to ensure connectivity and compatibility in our test center before shipped out. FS.COM test center is supported by a variety of mainstream original brand switches and groups of professional staff, helping our customers make the most efficient use of our products in their systems, network designs and deployments.

The original switches could be found nowhere but at FS.COM test center, eg: Juniper MX960 & EX 4300 series, Cisco Nexus 9396PX & Cisco ASR 9000 Series, HP 5900 Series & HP 5406R ZL2 V3(J9996A), Arista 7050S-64, Brocade ICX7750-26Q & ICX6610-48, Avaya VSP 7000 MDA 2, etc.



Cisco ASR 9000 Series(A9K-MPA-1X40GE)



ARISTA 7050S-64(DCS-7050S-64)



Juniper MX960



Brocade ICX 7750-26Q



Extreme Networks X670V VIM-40G4X



Mellanox M3601Q



Dell N4032F



HP 5406R ZL2 V3(J9996A)



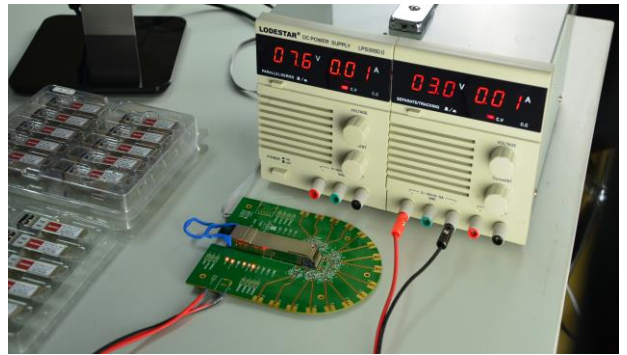
AVAYA 7024XLS(7002QQ-MDA)

Test Assured Program

FS.COM truly understands the value of compatibility and interoperability to each optics. Every module FS.COM provides must run through programming and an extensive series of platform diagnostic tests to prove its performance and compatibility. In our test center, we care of every detail from staff to facilities—professionally trained staff, advanced test facilities and comprehensive original-brand switches, to ensure our customers to receive the optics with superior quality.



Our smart data system allows effective product management and quality control according to the unique serial number, properly tracing the order, shipment and every part.



Our in-house coding facility programs all of our parts to standard OEM specs for compatibility on all major vendors and systems such as Cisco, Juniper, Brocade, HP, Dell, Arista and so on.



With a comprehensive line of original-brand switches, we can recreate an environment and test each optics in practical application to ensure quality and distance.



The last test assured step to ensure our products to be shipped with perfect package.

Order Information

Part Number	Description
QSFP28-SR4-100G	QSFP28 100GBASE-SR4 850nm 100m Transceiver
QSFP28-LR4-100G	QSFP28 100GBASE-LR4 1310nm 10km Transceiver
QSFP28-LR4-100G-I	QSFP28 100GBASE-LR4 1310nm 10km Industrial Transceiver
QSFP28-LR4-100G-C	QSFP28 100GBASE-LR4 1310nm 10km Transceiver
QSFP28-PLR4-100G	QSFP28 100GBASE-PSM4 1310nm 500m Transceiver
QSFP28-IR4-100G	QSFP28 100GBASE-CWDM4 1310nm 2km Transceiver
QSFP28-EIR4-100G	QSFP28 100GBASE-4WDM-10 1310nm 10km Transceiver
QSFP28-ER4-100G	QSFP28 100GBASE-ER4 1310nm 40km Transceiver
QSFP28-LR4-100G	QSFP28 100GBASE-LR4 and 112GBASE-OTU4 1310nm 10km Transceiver
QSFP28-LR4-100G	QSFP28 100GBASE-LR4 and 112GBASE-OTU4 1310nm 20km Transceiver
QSFP28-LR4-100G	QSFP28 100GBASE-LR4 and 112GBASE-OTU4 1310nm 25km Transceiver
QSFP28-LR4-100G	QSFP28 100GBASE-LR4 and 112GBASE-OTU4 1310nm 30km Transceiver
QSFP28-ER4-100G	QSFP28 100GBASE-LR4 and 112GBASE-OTU4 1310nm 40km Transceiver
QSFP28-DR-100G	QSFP28 100GBASE-DR Single Lambda 1310nm 500m Transceiver
QSFP28-FR-100G	QSFP28 100GBASE-FR Single Lambda 1310nm 2km Transceiver
QSFP28-LR-100G	QSFP28 100GBASE-LR Single Lambda 1310nm 10km Transceiver



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