FS.COM | Optical Communication System

Datasheet

QSFP28 100GBASE-LR4 1310nm 10km Transceiver

QSFP28-LR4-100G

Features

- Hot Pluggable QSFP28 form factor
- Supports 103.1Gb/s aggregate bit rate
- Maximum link length of 10km on Single Mode Fiber (SMF)
- Duplex LC receptacles
- Single 3.3V power supply
- Power dissipation <3.5W
- 4x26Gb/s DFB-based LAN-WDM transmitte
- 4x26G retimed electrical interface
- Commercial operating case temperature range: 0° C to 70° C
- I2C management interface
- RoHS-6 compliant

Application

- 100GBASE-LR4 100G Ethernet

Description

100G QSFP28 transceiver modules are designed for use in 100 Gigabit Ethernet links on up to 10km of single mode fiber. They are compliant with the QSFP28 MSAand IEEE 802.3ba 100GBASE-LR4 and IEEE 802.3bm CAUI-4. Digital diagnostics functions are available via the I2C interface, as specified by the QSFP28 MSA and Finisar Application Note AN-2152 . The transceiver is RoHS-6 compliant per Directive 2011/65/EC.

Product Specifications

I. General Product Characteristics

Parameter	Symbol	Min	Typ.	Max	Units	Ref.
Bit Rate (all wavelengths combined)	BR			103.1	Gb/s	1
Bit Error Ratio@25.78Gb/s	BER			10^{-12}		2
SMF per G.652	Lmax			10	km	

Notes:
1.Supports 100GBASE-LR4 per IEEE 802.3ba.
2. Tested with a 2^{31}-1 PRBS .

II. Absolute Maximum Ratings

Parameter	Symbol	Min	Typ.	Max	Unit	Ref.
Maximum Supply Voltage	Vcc	-0.5		3.6	V	
Storage Temperature	Ts	-40		85	° C	
Case Operating Temperature	Top	0		70	° C	
Relative Humidity	RH	15		85	%	1
Receiver Damage Threshold, per Lane	P_{Rdmg}	5.5			dBm	

Note:
1. 48-hour excursions, maximum
2. Non-condensing

III. Electrical Characteristics (EOL, TOP = 0 to 70℃, VCC = 3.135 to 3.465 Volts)

Parameter	Symbol	Min	Typ.	Max	Unit	Ref.
Supply Voltage	Vcc	3.135		3.465	V	
Supply Current	Icc			1.12	A	
Module total power	P			3.5	W	1
		Transmitter				
Signaling rate per lane		25.78125 ± 100ppm			GBd	
Differential data input swing per lane	Vin,pp			900	mV	
Differential input return loss (min)	RLd(f)	9.5 – 0.37f, 0.01⩽f<8 4.75 – 7.4log$_{10}$(f/14), 8 ⩽f<19			dB	
Differential to common mode input return loss (min)	RLdc(f)	22-20(f/25.78), 0.01⩽f<12.89 15-6(f/25.78), 12.89⩽f<19			dB	

Differential input return loss (min)	RLd(f)	9.5 – 0.37f, 0.01≤f<8 4.75 – 7.4log$_{10}$(f/14), 8 ≤f<19			dB	
Differential to common mode input return loss (min)	RLdc(f)	22-20(f/25.78), 0.01≤f<12.89 15-6(f/25.78), 12.89≤f<19			dB	
Differential termination mismatch				10	%	
Stressed input parameters						
Eye width			0.46		UI	
Applied pk-pk sinusoidal jitter		Per IEEE 802.3bm Table 88-13				
Eye height			95		mV	
DC common mode voltage		-350		2850	mV	
Receiver						
Signaling rate per lane		25.78125 ± 100ppm			GBd	
Differential data output swing	Vout,pp	100		400	mVpp	2
		300		600		
		400		800		
		600		1200		
Eye width		0.57			UI	

Vertical eye closure				5.5	dB	
Differential output return loss (min)	RLd(f)	9.5 – 0.37f, 0.01≤f<8 4.75 – 7.4log$_{10}$ (f/14), 8 ≤f<19			dB	
Common to differential modeconversion return loss (min)	RLdc(f)	22-20(f/25.78), 0.01≤f<12.89 15-6(f/25.78), 12.89≤f<19			dB	
Differential termination mismatch				10	%	
Transition time, 20% to 80%	t r, t f	12			ps	

Notes:

1. Maximum total power value is specified across the full temperature and voltage range.
2. Output voltage is settable in 4 discrete ranges via I2C. Default range is 400 – 800 mV.

IV. Optical Characteristics (EOL, TOP = 0 to 70℃, VCC = 3.135 to 3.465 Volts)

Parameter	Symbol	Min	Typ.	Max	Unit	Ref.
Transmitter						
Signaling Speed per Lane			25.78125 ± 100 ppm		Gb/s	1
Lane center wavelengths (range)			1294.53 – 1296.59 1299.02 – 1301.09 1303.54 – 1305.63 1308.09 – 1310.19		nm	
Total Average Launch Power	POUT			10.5	dBm	
Average Launch Power per Lane	TXPx	-4.3		4.5	dBm	2
Transmit OMA per Lane	TxOMA	-1.3		4.5	dBm	
Optical Extinction Ratio	ER	4			dB	
Sidemode Suppression ratio	SSRmin	30			dB	
Average launch power of OFF transmitter, per lane				-30	dBm	
Relative Intensity Noise	RIN			-130	dBm	
Optical Return Loss Tolerance				20	dB	
Transmitter Reflectance				-12	dB	
Transmitter eye mask definition {X1,X2, X3, Y1, Y2, Y3}		{0.25, 0.4, 0.45, 0.25, 0.28, 0.4}				3

Parameter	Symbol	Min	Typ.	Max	Unit	Ref.
Receiver						
Signaling Speed per Lane			25.78125 ± 100ppm		GBd	4
Lane center wavelengths (range)			1294.53 – 1296.59 1299.02 – 1301.09 1303.54 – 1305.63 1308.09 – 1310.19		nm	
Return Loss	RL	-26			dB	
Receive Power (OMA) per Lane	RxOMA			4.5	dBm	
Average Receive Power per Lane	RXPx	-10.6		4.5	dBm	5
Receiver Sensitivity (OMA) per Lane	Rxsens			-8.6	dBm	
Stressed Receiver Sensitivity (OMA) per Lane	SRS			-6.8	dBm	6
Receive electrical 3 dB upper cutoff frequency, per lane	SEC			31	GHz	
LOS De-Assert	LOSD			-11.6	dBm	
LOS Assert	LOSA	-24		-13.6	dBm	
LOS Hysteresis			1.5		dBm	

Notes:

1. Transmitter consists of 4 lasers operating at 25.78Gb/s each.
2. Minimum value is informative.
3. Hit ratio $5x10^{-5}$.
4. Receiver consists of 4 photodetectors operating at 25.78Gb/s each.
5. Minimum value is informative, equals min TxOMA with infinite ER and max channel insertion loss.
6. SRS is measured with vertical eye closure penalty of 1.8 dB max, J2 of 0.30 UI, and J9 of 0.47 UI.

V. Pin Description

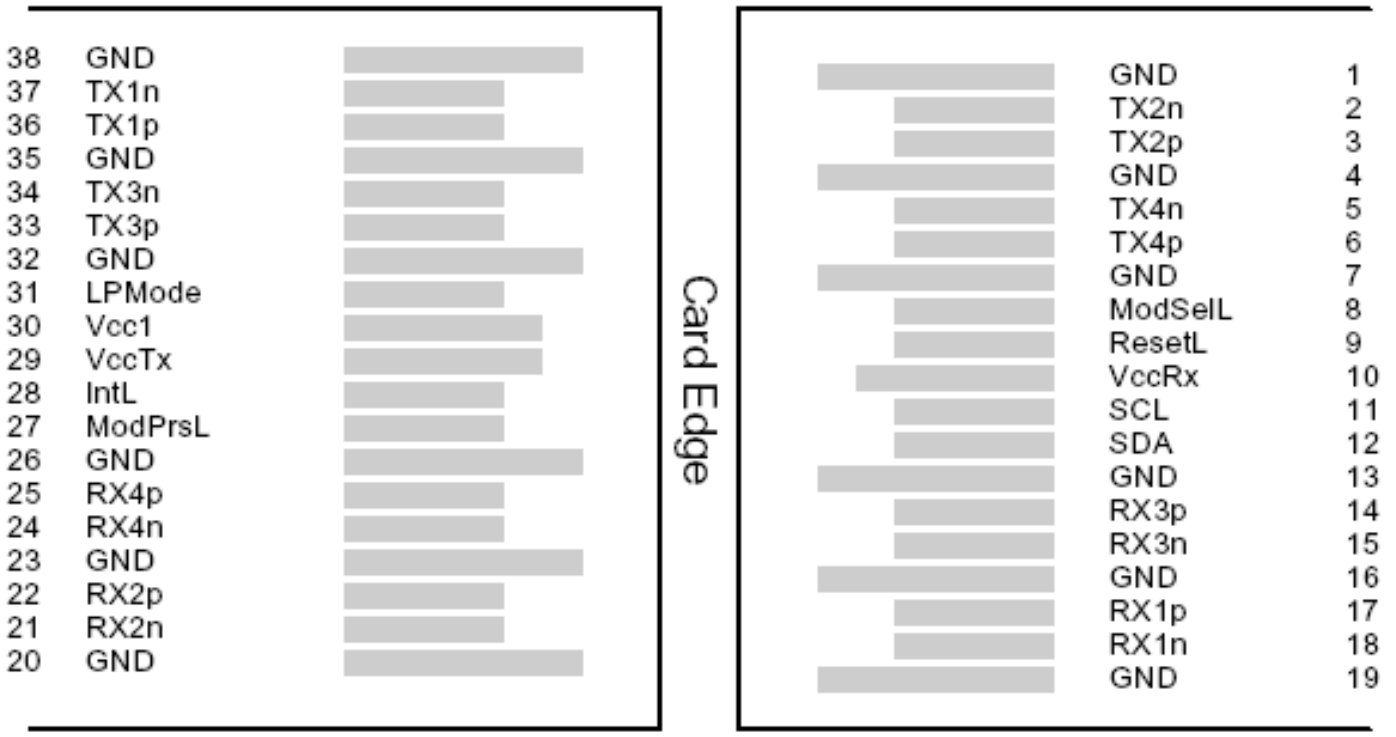


Figure 1 – QSFP28-compliant 38-pin connector (per SFF-8679)

Pin	Symbol	Name/Description	Notes
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	

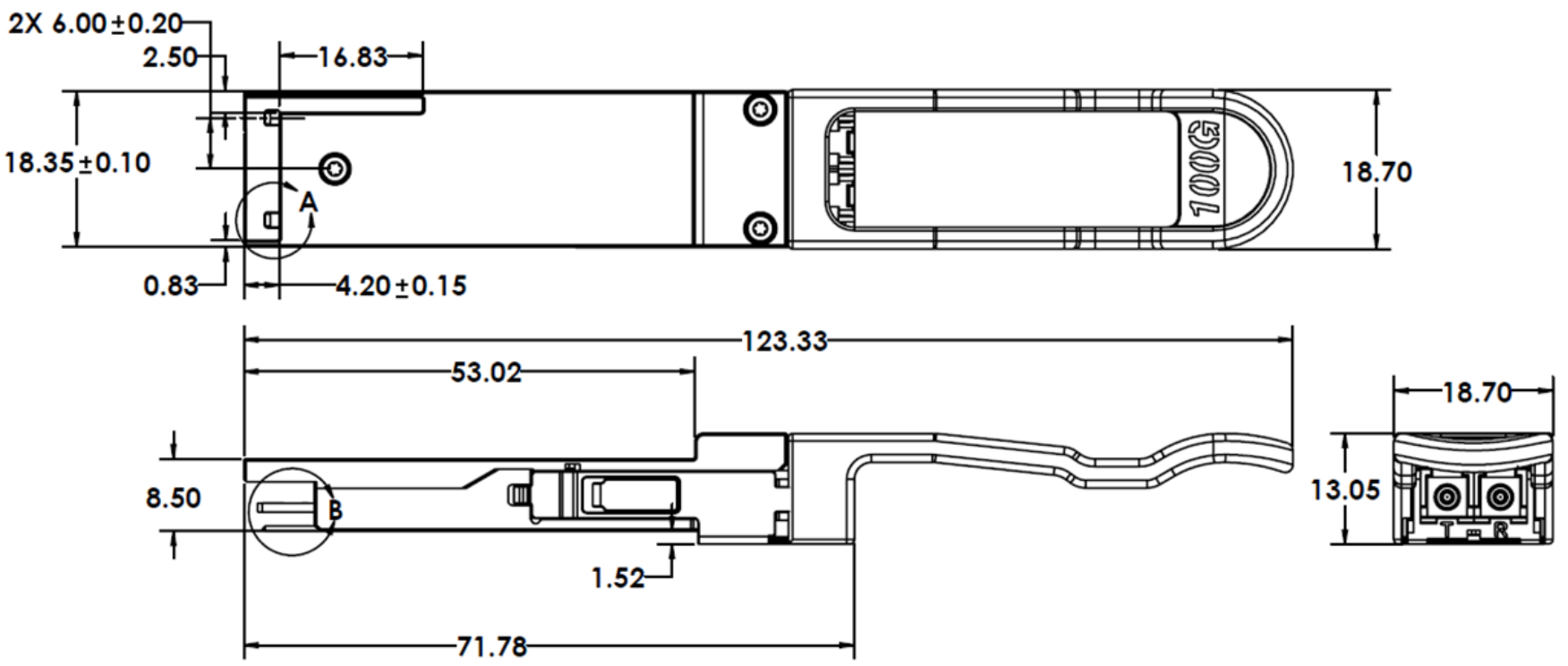
10	Vcc Rx	+3.3 V Power supply receiver	
11	SCL	2-wire serial interface clock	
12	SDA	2-wire serial interface data	
13	GND	Ground	1
14	Rx3p	Receiver Non-Inverted Data Output	
15	Rx3n	Receiver Inverted Data Output	
16	GND	Ground	1
17	Rx1p	Receiver Non-Inverted Data Output	
18	Rx1n	Receiver Inverted Data 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	Vcc Tx	+3.3 V Power supply transmitter	
30	Vcc1	+3.3 V Power Supply	
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

Note:
1. Circuit ground is internally isolated from chassis ground.

VI. Mechanical Specifications

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



Test Center

Only when quality and 100% compatibility is verified and proved do our modules enter the market. This depends on FS.COM's test center which is supported by a variety of mainstream original brand switches and professional staff. We are proud of this test center and believe all of these devices worth the investments, because it brings the best to our customers.

The original switches could be found nowhere but at FS.COM's 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

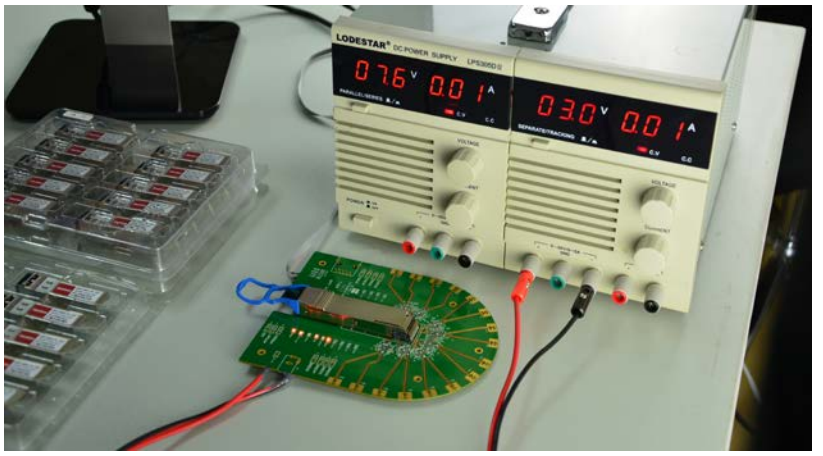
HP 5406R ZL2 V3(J9996A)

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

Note:
Every transceiver is individually tested on corresponding equipment, walks through the testing challenges and 100% compatible with Cisco, Arista, Juniper, Dell, Brocade and other brands.

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