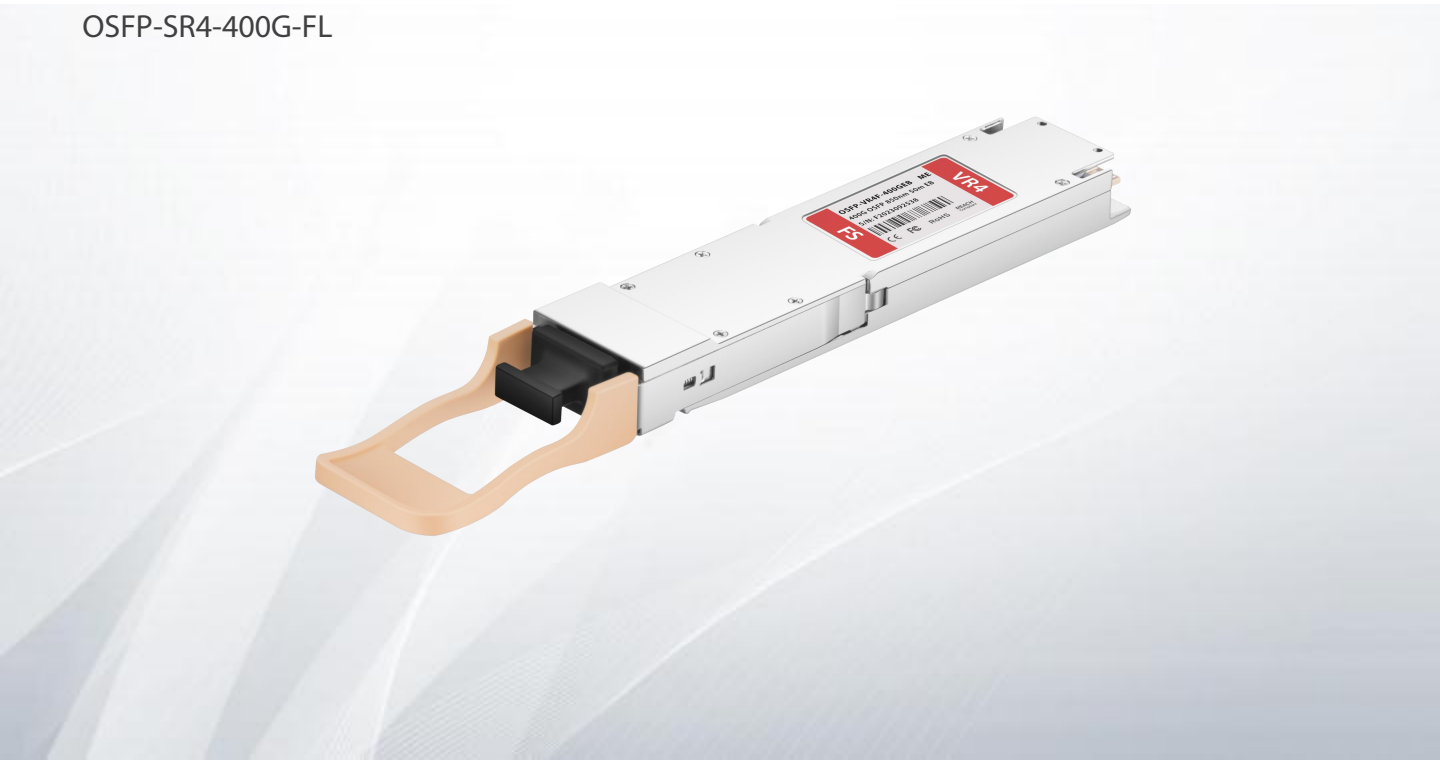
400GBASE-SR4 OSFP PAM4 850nm 50m MTP/MPO MMF Transceiver

OSFP-SR4-400G-FL



Application

- 400G Ethernet
- Infiniband Interconnect

Standards

- OSFP MSA
- IEEE 802.3ck

Features

- OSFP MSA
- Up to 106.25Gbps Data Rate Per Channel by PAM4 Modulation
- Up to 50m OM4 MMF transmission
- MTP/MPO-12 (APC) Optical Connector
- CMIS Compliance
- Single 3.3 V Power Supply
- Maximum Power Consumption 9W
- Operating Case Temperature: 20°C to 70°C

Description

The 400GBASE-VR4F OSFP module, MTP/MPO-12 connector, up to 50m over parallel OM4 multi-mode fiber.

It is compliant with OSFP MSA, IEEE 802.3ck protocol and 400GAUI-4 standards.

The built-in digital diagnostics monitoring (DDM) allows access to real-time operating parameters.

It is suitable for 400G Ethernet and Infiniband. It also support 1 x 400G point to point connection.

Product Specifications

I. Absolute Maximum Ratings

It has to be noted that the operation in excess of any individual absolute maximum ratings might cause permanent damage to this module.

II. Recommended Operating Conditions

Parameter	Symbol	Min.	Typ.	Max.	Unit	Note
Operating Case Temperature	Top	0		70	°C	
Power Supply Voltage	Vcc	3.135	3.3	3.465	V	
Data Rate, each Lane			53.125		GBd	PAM4
Data Rate Accuracy		-100		100	ppm	
Pre-FEC Bit Error Ratio				2.4x10-4		
Post-FEC Bit Error Ratio				1x10-12		1
Link Distance with OM4	D1	2		50	m	2
Link Distance with OM3	D2	2		30	m	2

Notes:

[1] FEC provided by host system.

[2] FEC required on host system to support maximum distance.

III. Optical Characteristic

Parameter	Symbol	Min.	Typ.	Max.	Unite	Note
Transmitter						
Data Rate, each Lane			53.125 ± 100 ppm		GBd	
Modulation Format			PAM4			
Wavelength	λ	842		948	nm	
RMS Spectral Width				0.65	nm	1
Average Launch Power, each Lane	PAVG	-4.6		4	dBm	
Outer Optical Modulation Amplitude (OMAouter), each Lane	POMA	-2.6(For max (TECQ, TDECQ) ≤1.8 dB)-4.4 + max(TECQ, TDECQ) （For 1.8＜ max (TECQ, TDECQ) ≤ 4.4 dB)		3.5	dBm	
Transmitter and Dispersion Eye Closure for PAM4 (TDECQ), each Lane	TDECQ			4.4	dB	
Transmitter Eye Closure for PAM4, each Lane	TECQ			4.4	dB	
Overshoot/Undershoot				29	%	
Transmitter Power Excursion, each Lane				2.3	dBm	
Extinction Ratio	ER	2.5			dB	
Transition Time	Tt			17	ps	
Average Launch Power of OFF Transmitter, each Lane	Poff			-30	dBm	
RIN 14 OMA	RIN			-132	dB/Hz	
Optical Return Loss Tolerance	TOL			14	dB	

Parameter	Symbol	Min.	Typ.	Max.	Unite	Note
Encircled Flux			≥ 86% at 19 μm ≤ 30% at 4.5 μm			2
Receiver						
Data Rate, each Lane			53.125 ± 100 ppm		GBd	
Modulation Format			PAM4			
Center Wavelength	λ	842		948	Nm	
Damage Threshold, each Lane	THd	5			dBm	3
Average Receive Power, each Lane		-6.3		4	dBm	4
Receive Power (OMA outer), each Lane				3.5	dBm	
Receiver Reflectance	RR			-15	dB	
Receiver Sensitivity (OMAouter),each Lane	SEN			-4.4(For TECQ ≤1.8 dB） –6.2 +TECQ （For 1.8 ＜TECQ ≤ 4.4 dB)	dBm	5
Stressed Receiver Sensitivity(OMAouter), each Lane	SRS			-1.8	dBm	6
LOS Assert	LOSA	-15			dBm	
LOS De-assert	LOSD			-9.2	dBm	
LOS Hysteresis	LOSH	0.5			dB	
Stressed Eye Closure for PAM4 (SECQ), Lane under Test			4.4		dB	

Parameter	Symbol	Min.	Typ.	Max.	Unite	Note
OMAouter of each Aggressor Lane			3.5		dBm	2

Notes:

[1] RMS spectral width is the standard deviation of the spectrum.

[2] If measured into type A1a.2 or type A1a.3, or A1a.4, 50 µm fiber, in accordance with IEC 61280-1-4.

[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.

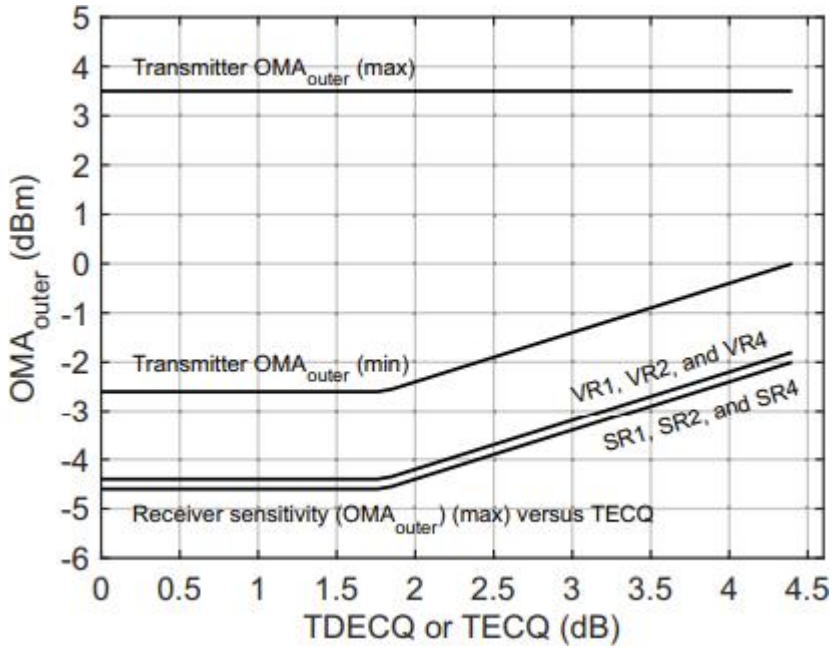
[4] Average receive power, each lane (min) is informative and not the principal indicator of signal strength.
A received power below this
value cannot be compliant; however, a value above this does not ensure compliance.

[5] Receiver sensitivity (OMAouter) is informative and is defined for a transmitter with a value of TECQ up to 4.4 dB.
Receiver sensitivity should meet Equation (1)

$$RS = \max(-4.4, TECQ - 6.2) \quad (1)$$

Where: RS is the receiver sensitivity,
and TECQis the TECQ of the transmitter used to measure the receiver sensitivity.[6]
Measured with conformance test signal at TP3 for the BER equal to 2.4x10-4.

[7] These test conditions are for measuring stressed receiver sensitivity. They are not characteristics of the receiver.



IV. Electrical Characteristics

Parameter	Test Point	Min.	Typ.	Max.	Unit	Note
Power Consumption				9	W	
Supply Current	Icc			3.83	A	
Module Input (each Lane)						
Signaling Rate, each Lane	TP1		53.125 ± 100 ppm		GBd	
Differential pk-pk Voltage Tolerance	TP1a	750			mV	
Peak-to-peak AC Common- Mode Voltage Tolerance Low-frequency, VCMLF Full-band,VCMFB	TP1a	3280			mV	
Differential-mode to Common-mode Return Loss, RLcd	TP1	IEEE 802.3ckEquation(120G–2)			dB	
Effective Return Loss, ERL	TP1	8.5			dB	
Differential Termination Mismatch	TP1			10	%	
Module Stressed Input Tolerance	TP1a		IEEE802.3ck 120G.3.4.3			
Single-ended Voltage Tolerance Range	TP1a		–0.4 to 3.3		V	
DC Common-mode Voltage Tolerance Upper Limit Lower Limit	TP1		2.85 –0.35		V	
Receiver (each Lane)						
Signaling Rate, each Lane	TP4		53.125 ± 100 ppm		GBd	
Peak-to-peak AC Common- mode Voltage Low-frequency, VCMLF Full-band, VCMFB	TP4			32 80	mV	
Differential peak-to-peak Output Voltage Short Mode Long Mode	TP4			600845	mV	
Eye Height	TP4	15			mV	

Parameter	Test Point	Min.	Typ.	Max.	Unit	Note
Vertical Eye Closure, VEC	TP4			12	dB	
Common-mode to Differential-mode Return loss, RLdc	TP4	IEEE802.3ck Equation (120G–1)			dB	
Effective Return Loss, ERL	TP4	8.5			dB	
Differential Termination Mismatch	TP4	8.5			ps	
DC common-mode Voltage Tolerance Upper Limit Lower Limit	TP4		2.85 -0.35		V	

V.Digital Diagnostic Monitor Characteristics

Parameter	Symbol	Min.	Max.	Unit	Notes
Temperature Monitor Absolute Error	DMI_Temp	-3	3	degC	Over Operating Temperature Range
Supply Voltage Monitor Absolute Error	DMI_VCC	-0.1	0.1	V	Over Full Operating Range
Channel RX Power Monitor Absolute Error	DMI_RX_Ch	-2	2	dB	1
Channel Bias Current Monitor	DMI_Ibias_Ch	-10%	10%	mA	
Channel TX Power Monitor Absolute Error	DMI_TX_Ch	-2	2	dB	1

Notes:

[1] Due to measurement accuracy of different single mode fibers, therecould be an additional +/-1 dB fluctuation, or a +/- 3 dB total accuracy.

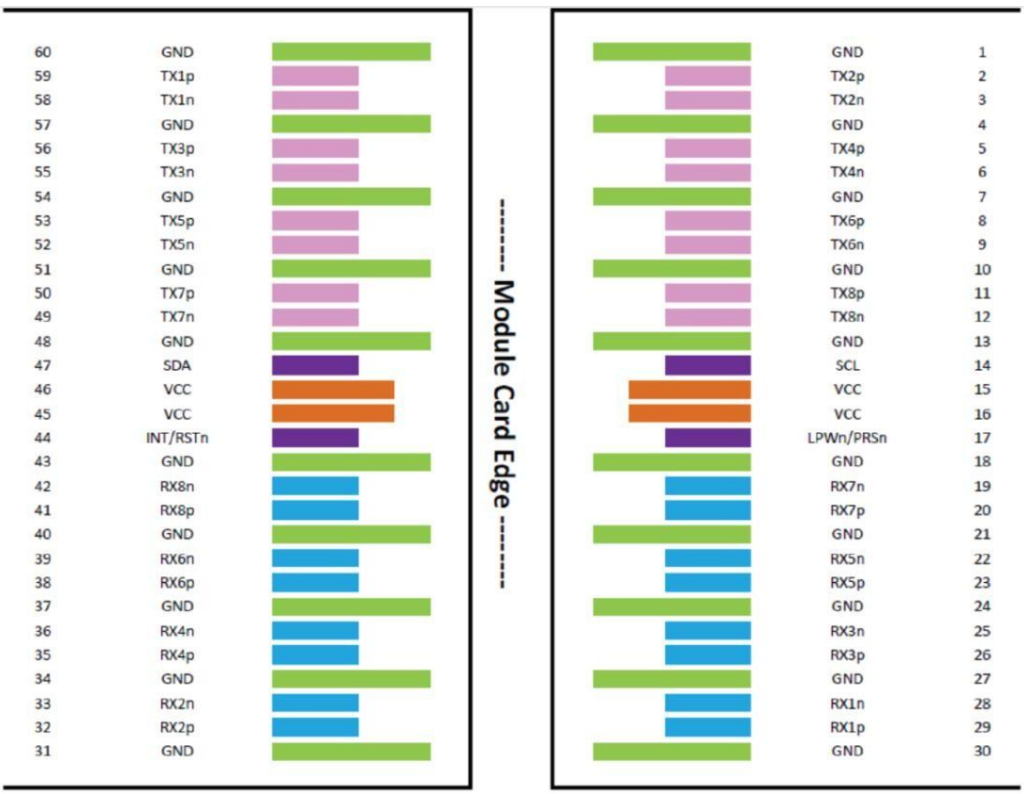
V. Pin Assignment

Pin	Symbol	Description	Logic	Direction	Plug Sequence
1	GND		Ground		1
2	TX2p	Transmitter Data Non-Inverted	CML-I	Input from Host	3
3	TX2n	Transmitter Data Inverted	CML-I	Input from Host	3
4	GND		Ground		1
5	TX4p	Transmitter Data Non-Inverted	CML-I	Input from Host	3
6	TX4n	Transmitter Data Inverted	CML-I	Input from Host	3
7	GND		Ground		1
8	TX6p	Transmitter Data Non-Inverted	CML-I	Input from Host	3
9	TX6n	Transmitter Data Inverted	CML-I	Input from Host	3
10	GND		Ground		1
11	TX8p	Transmitter Data Non-Inverted	CML-I	Input from Host	3
12	TX8n	Transmitter Data Inverted	CML-I	Input from Host	3
13	GND		Ground		1
14	SCL	2-wire Serial interface clock	LVCMOS-I/O	Bi-directional	3
15	VCC	+3.3V Power		Power from Host	2
16	VCC	+3.3V Power		Power from Host	2
17	LPWn/PRSn	Low-Power Mode / Module Present	Multi-Level	Bi-directional	3
18	GND		Ground		1

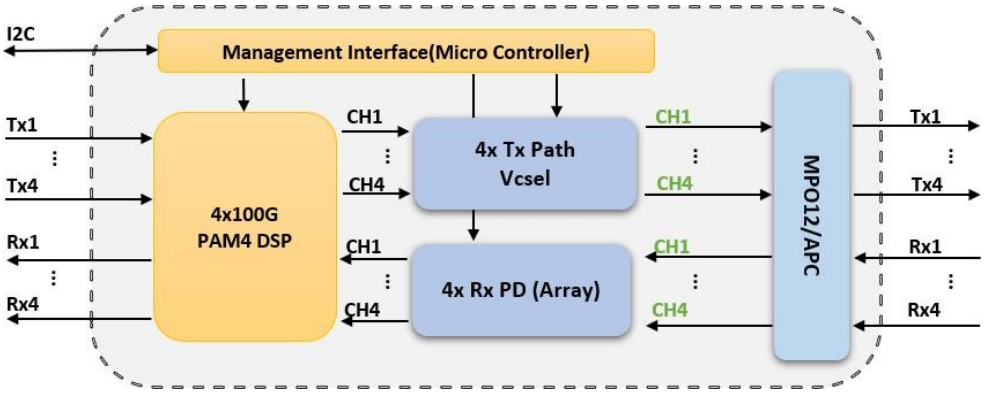
Pin	Symbol	Description	Logic	Direction	Plug Sequence
19	RX7n	Receiver Data Inverted	CML-O	Output to Host	3
20	RX7p	Receiver Data Non-Inverted	CML-O	Output to Host	3
21	GND		Ground		1
22	RX5n	Receiver Data Inverted	CML-O	Output to Host	3
23	RX5p	Receiver Data Non-Inverted	CML-O	Output to Host	3
24	GND		Ground		1
25	RX3n	Receiver Data Inverted	CML-O	Output to Host	3
26	RX3p	Receiver Data Non-Inverted	CML-O	Output to Host	3
27	GND		Ground		1
28	RX1n	Receiver Data Inverted	CML-O	Output to Host	3
29	RX1p	Receiver Data Non-Inverted	CML-O	Output to Host	3
30	GND		Ground		1
31	GND		Ground		1
32	RX2p	Receiver Data Non-Inverted	CML-O	Output to Host	3
33	RX2n	Receiver Data Inverted	CML-O	Output to Host	3
34	GND		Ground		1
35	RX4p	Receiver Data Non-Inverted	CML-O	Output to Host	3
36	RX4n	Receiver Data Inverted	CML-O	Output to Host	3

Pin	Symbol	Description	Logic	Direction	Plug Sequence
37	GND		Ground		1
38	RX6p	Receiver Data Non-Inverted	CML-O	Output to Host	3
39	RX6n	Receiver Data Inverted	CML-O	Output to Host	3
40	GND		Ground		1
41	RX8p	Receiver Data Non-Inverted	CML-O	Output to Host	3
42	RX8n	Receiver Data Inverted	CML-O	Output to Host	3
43	GND		Ground		1
44	INT/RSTn	Module Interrupt / Module Reset	Multi-Level	Bi-directional	3
45	VCC	+3.3V Power		Power from Host	2
46	VCC	+3.3V Power		Power from Host	2
47	SDA	2-wire Serial interface data	LVCMOS-I/O	Bi-directional	3
48	GND		Ground		1
49	TX7n	Transmitter Data Inverted	CML-I	Input from Host	3
50	TX7p	Transmitter Data Non-Inverted	CML-I	Input from Host	3
51	GND		Ground		1
52	TX5n	Transmitter Data Inverted	CML-I	Input from Host	3
53	TX5p	Transmitter Data Non-Inverted	CML-I	Input from Host	3
54	GND		Ground		1

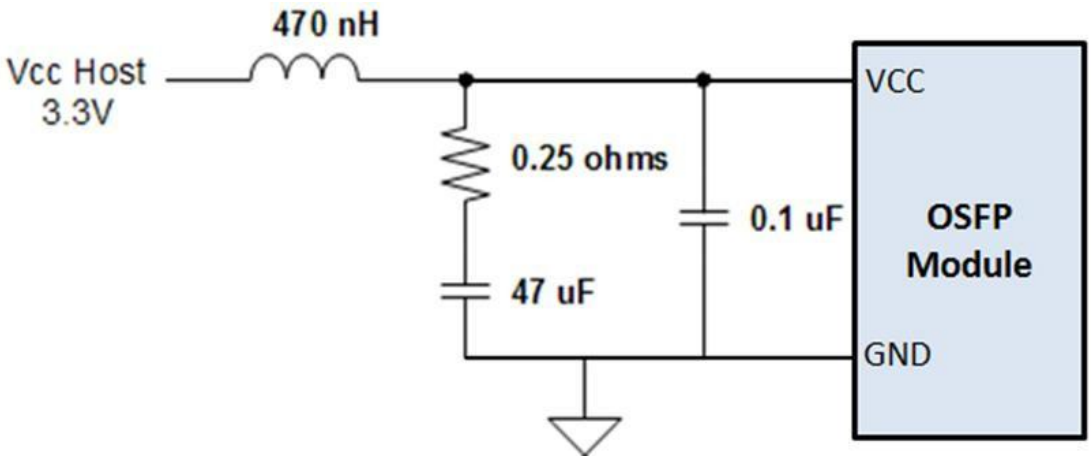
Pin	Symbol	Description	Logic	Direction	Plug Sequence
55	TX3n	Transmitter Data Inverted	CML-I	Input from Host	3
56	TX3p	Transmitter Data Non-Inverted	CML-I	Input from Host	3
57	GND		Ground		1
58	TX1n	Transmitter Data Inverted	CML-I	Input from Host	3
59	TX1p	Transmitter Data Non-Inverted	CML-I	Input from Host	3
60	GND		Ground		1



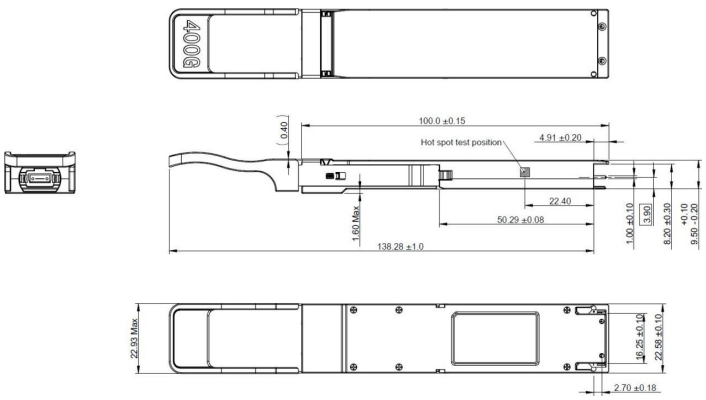
VI. Optical Module Block Diagram



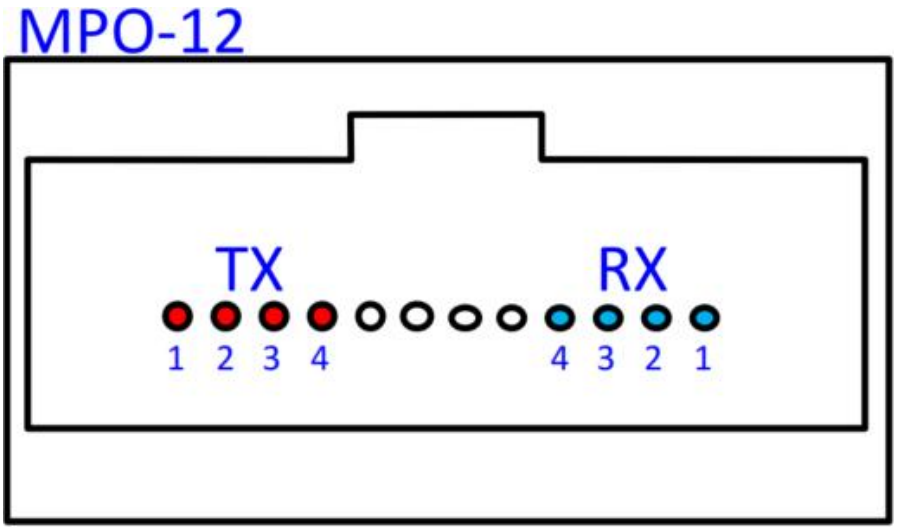
VII. Recommended Power Supply Filter



VIII. Diagram Mechanical Dimensions



IX. Optical Interface



X. ESD

This transceiver is specified as ESD threshold 1kV for high speed data pins and 2kV for all other electrical input pins, tested per MIL-STD -883, Method 3015.4 /JESD22-A114-A (HBM). However normal ESD precautions are still required during the handling of this module.
This transceiver is shipped in ESD protective packaging.
It should be removed from the packaging and handled only in an ESD protected environment.

XI. Laser Safety

This is a Class I Laser Product, or Class 1 Laser Product according to IEC/EN 60825-1:2014.
This product complies with 21 CFR 1040.10 and 1040.11 except for conformance with IEC 60825-1 Ed. 3.as described in Laser Noti ce No.56, dated May 8, 2019.

Caution: Use of controls or adjustments or performance of procedures other than those specified herein may result in hazardous radiation exposure.

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

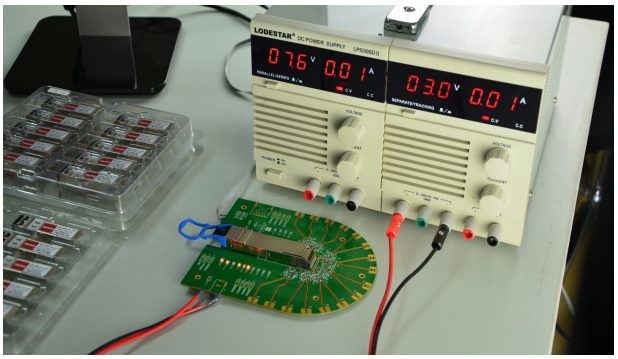
HP 5406R ZL2 V3(J9996A)

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.

Ordering Information

Part Number	Description
OSFP-VR4F-400GEB	OSFP 400GBASE-VR4F 850nm 50m EB Transceiver
OSFP-SR8-400G	OSFP 400GBASE-SR8 850nm 100m Transceiver
OSFP-DR4-400G-Si	OSFP 400GBASE-DR4 1310nm 500m Silicon Photorics Transceiver
QDD-SR4.2-400G	QSFP-DD 400GBASE-SR4.2 850nm 100m Transceiver
QDD-DR4-400G-Si	QSFP-DD 400GBASE-DR4 1310nm 500m Silicon Photonics Transceiver
QSFPDD-SR8-400G	QSFP-DD 400GBASE-SR8 850nm 100m Transceiver
QSFPDD-DR4-400G	QSFP-DD 400GBASE-DR4 1310nm 500m Transceiver
QSFPDD-XDR4-400G	QSFP-DD 400GBASE-DR4+ 1310nm 2km Transceiver
QSFPDD-FR4-400G	QSFP-DD 400GBASE-FR4 1310nm 2km Transceiver
QSFPDD-LR4-400G	QSFP-DD 400GBASE-LR4 1310nm 10km Transceiver
QSFPDD-PLR4-400G	QSFP-DD 400GBASE-PLR4 1310nm 10km Transceiver
QSFPDD-ER8-400G	QSFP-DD 400GBASE-ER8 1310nm 40km Transceiver