



MMS4X00-NS400-SKY

Mellanox® MMS4X00-NS400 Compatible 400GBase-DR4 PAM4 OSFP112 RHS Transceiver (SMF, 1310nm, 500m, MPO, DOM, CMIS 5.0)

Product Description

This Mellanox® MMS4X00-NS400 compatible OSFP112 RHS transceiver provides 400GBase-DR4 throughput up to 500m over single-mode fiber (SMF) PAM4 using a wavelength of 1310nm via an MPO connector. It can operate at temperatures between 0 and 70C. Our transceiver is built to meet or exceed OEM specifications and is guaranteed to be 100% compatible with Mellanox®. It has been programmed, uniquely serialized, and tested for data-traffic and application to ensure that it will initialize and perform identically. All of our transceivers comply with Multi-Source Agreement (MSA) standards to provide seamless network integration. Additional product features include Digital Optical Monitoring (DOM) support which allows access to real-time operating parameters. We stand behind the quality of our products and proudly offer a limited lifetime warranty.

Skylane's transceivers are RoHS compliant and lead-free.

Features:

- 4x100G PAM4 Data Rates
- Hot Pluggable OSFP Form Factor
- Single 3.3V Power Supply
- I2C Management Interface Compliant to CMIS Rev5.0
- Compliant with IEEE 802.3 bs 400GBASE-DR4
- Electrical Interface Compliant with 100Gbps Per Lane Defined by IEEE 802.3ck
- Internal CDR on Both Transmitter and Receiver Channels
- PIN Receiver
- Operating Temperature: 0 to 70 Celsius
- Cooled 1310nm EML Laser
- RoHS Compliant and Lead-Free



Applications:

- 400GBase Ethernet

For your product safety, please read the following information carefully before any manipulation of the transceiver:



ESD

This transceiver is specified as ESD threshold 1kV for SFI pins and 2kV for all others electrical input pins, tested per MIL-STD-883G, Method 3015.4 /JESD22-A114-A (HBM). However, normal ESD precautions are still required during the handling of this module.



LASER SAFETY

This is a Class1 Laser Product according to IEC 60825-1:2007. This product complies with 21 CFR 1040.10 and 1040.11 except for deviations pursuant to Laser Notice No. 50, dated (June 24, 2007).

The optical ports of the module need to be terminated with an optical connector or with a dust plug in order to avoid contamination.

Absolute Maximum Ratings

Parameter	Symbol	Min.	Typ.	Max.	Unit
Maximum Supply Voltage	V _{cc}	-0.5		3.6	V
Supply Voltage	V _{cc}	3.13	3.3	3.47	V
Storage Temperature	T _{stg}	-40		85	°C
Operating Temperature	T _c	0	40	70	°C
Relative Humidity	RH	15		85	%
Data Rate			106.25±100ppm		Gbps

Notes:

1. Stressed in excess of the Absolute Maximum Ratings can cause permanent damage to the device. These are absolute stress ratings only. Functional operation of the device is not implied at these or any other conditions in excess of those given in the operational sections of the datasheet. Exposure to Absolute Maximum Ratings for extended periods can adversely affect device reliability.

Electrical Characteristics

Parameter	Symbol	Min.	Typ.	Max.	Unit	Notes
Module Supply Current	I _{cc}			2.87	A	
Power Dissipation	P _{DISS}			9	W	
Transmitter						
Input Differential Impedance	Z _{IN}	90	100	110	Ω	
Differential Data Input Swing	V _{IN,pp}			900	mVp-p	
DC Common-Mode Input Voltage		-350		2850	mV	
Receiver						
Output Differential Impedance	Z _{OUT}	90	100	110	Ω	
Differential Data Output Swing	V _{OUT,pp}			900	mVp-p	1
Dual Function Signals						
INT/RSTn	V_INT/RSTn_1	0.000	0.000	1.000	V	2
	V_INT/RSTn_2	0.000	0.000	1.000	V	3
	V_INT/RSTn_3	1.500	1.900	2.250	V	4
	V_INT/RSTn_4	2.750	3.000	3.465	V	5
LPWn/PRSn	V_LPWn/PRSn_1	0.000	0.950	1.100	V	6
	V_LPWn/PRSn_2	1.400	1.700	2.250	V	7
	V_LPWn/PRSn_3	2.750	3.300	3.465	V	8

Notes:

1. Internally AC coupled but requires an external 100Ω differential load termination.
2. INT/RSTn voltage for no Module.

3. INT/RSTn voltage for Module installed, H_RSTn=Low.
4. INT/RSTn voltage for Module installed, H_RSTn=High, M_INT=Low.
5. INT/RSTn voltage for Module installed, H_RSTn=High, M_INT= High.
6. LPWn/PRSn voltage for Module installed, H_LPWn=Low.
7. LPWn/PRSn voltage for Module installed, H_LPWn =High.
8. LPWn/PRSn voltage for no Module.

Optical Characteristics

Parameter	Symbol	Min.	Typ.	Max.	Unit	Notes
Transmitter						
Average Launch Power Per Lane	Pavg	-2.9		4	dBm	1
Outer Optical Modulation Amplitude Per Lane	POMA	-0.8		4.2	dBm	1
Extinction Ratio	ER	3.5			dB	
Lane Wavelengths	λ	1304.5		1317.5	nm	
Side-Mode Suppression Ratio	SMSR	30			dB	
Transmitter and Dispersion Penalty Eye Closure Per Lane	TDECQ			3.4	dB	
Launch Power in OMAouter Minus TDECQ Per Lane	OMA-TDECQ	-2.2			dBm	
Average Launch Power of Off Transmitter	Poff			-15	dBm	
Optical Return Loss Tolerance	ORLT			21.4	dB	
Transmitter Reflectance				-26	dB	
Receiver						
Lane Wavelengths	λ	1304.5		1317.5	nm	
Receiver Sensitivity (OMA)	RxSENS			-3.9	dBm	2
Receiver Overload Per Lane (Pavg)	POL	4			dBm	
Damage Threshold Per Lane		5			dBm	
Receiver Power Per Lane (OMAouter)	OMA			4.2	dBm	
Receiver Reflectance				-26	dB	
LOS De-Assert	LOSD			-10	dBm	
LOS Assert	LOSA	-16			dBm	
LOS Hysteresis		0.5			dB	

Notes:

1. Class 1 Laser Safety per FDA/CDRH and EN (IEC) 60825 regulations.
2. Measured with PRBS31Q test pattern, 53.125GBd, PAM4, and BER<2.4E⁻⁴.

Pin Descriptions

Pin	Logic	Symbol	Name/Description	Direction	Plug Sequence	Notes
1		GND	Module Ground.		1	
2	CML-I	Tx2+	Transmitter Non-Inverted Data.	Input from Host	3	
3	CML-I	Tx2-	Transmitter Inverted Data.	Input from Host	3	
4		GND	Module Ground.		1	
5	CML-I	Tx4+	Transmitter Non-Inverted Data.	Input from Host	3	
6	CML-I	Tx4-	Transmitter Inverted Data.	Input from Host	3	
7		GND	Module Ground.		1	
8	CML-I	Tx6+	Transmitter Non-Inverted Data.	Input from Host	3	
9	CML-I	Tx6-	Transmitter Inverted Data.	Input from Host	3	
10		GND	Module Ground.		1	
11	CML-I	Tx8+	Transmitter Non-Inverted Data.	Input from Host	3	
12	CML-I	Tx8-	Transmitter Inverted Data.	Input from Host	3	
13		GND	Module Ground.		1	
14	LVC MOS-I/O	SCL	2-Wire Serial Interface Clock.	Bi-Directional	3	1
15		Vcc	+3.3V Power Supply.	Power from Host	2	
16		Vcc	+3.3V Power Supply.	Power from Host	2	
17	Multi-Level	LPWn/PRSn	Low-Power Mode/Module Present.	Bi-Directional	3	2
18		GND	Module Ground.		1	
19	CML-O	Rx7-	Receiver Inverted Data.	Output to Host	3	
20	CML-O	Rx7+	Receiver Non-Inverted Data.	Output to Host	3	
21		GND	Module Ground.		1	
22	CML-O	Rx5-	Receiver Inverted Data.	Output to Host	3	
23	CML-O	Rx5+	Receiver Non-Inverted Data.	Output to Host	3	
24		GND	Module Ground.		1	
25	CML-O	Rx3-	Receiver Inverted Data.	Output to Host	3	
26	CML-O	Rx3+	Receiver Non-Inverted Data.	Output to Host	3	
27		GND	Module Ground.		1	
28	CML-O	Rx1-	Receiver Inverted Data.	Output to Host	3	
29	CML-O	Rx1+	Receiver Non-Inverted Data.	Output to Host	3	
30		GND	Module Ground.		1	
31		GND	Module Ground.		1	
32	CML-O	Rx2+	Receiver Non-Inverted Data.	Output to Host	3	
33	CML-O	Rx2-	Receiver Inverted Data.	Output to Host	3	
34		GND	Module Ground.		1	
35	CML-O	Rx4+	Receiver Non-Inverted Data.	Output to Host	3	

36	CML-O	Rx4-	Receiver Inverted Data.	Output to Host	3	
37		GND	Module Ground.		1	
38	CML-O	Rx6+	Receiver Non-Inverted Data.	Output to Host	3	
39	CML-O	Rx6-	Receiver Inverted Data.	Output to Host	3	
40		GND	Module Ground.		1	
41	CML-O	Rx8+	Receiver Non-Inverted Data.	Output to Host	3	
42	CML-O	Rx8-	Receiver Inverted Data.	Output to Host	3	
43		GND	Module Ground.		1	
44	Multi-Level	INT/RSTn	Module Interrupt/Module Reset.	Bi-Directional	3	2
45		Vcc	+3.3V Power Supply.	Power from Host	2	
46		Vcc	+3.3V Power Supply.	Power from Host	2	
47	LVC MOS-I/O	SDA	2-Wire Serial Interface Data.	Bi-Directional	3	1
48		GND	Module Ground.		1	
49	CML-I	Tx7-	Transmitter Inverted Data.	Input from Host	3	
50	CML-I	Tx7+	Transmitter Non-Inverted Data.	Input from Host	3	
51		GND	Module Ground.		1	
52	CML-I	Tx5-	Transmitter Inverted Data.	Input from Host	3	
53	CML-I	Tx5+	Transmitter Non-Inverted Data.	Input from Host	3	
54		GND	Module Ground.		1	
55	CML-I	Tx3-	Transmitter Inverted Data.	Input from Host	3	
56	CML-I	Tx3+	Transmitter Non-Inverted Data.	Input from Host	3	
57		GND	Module Ground.		1	
58	CML-I	Tx1-	Transmitter Inverted Data.	Input from Host	3	
59	CML-I	Tx1+	Transmitter Non-Inverted Data.	Input from Host	3	
60		GND	Module Ground.		1	

Notes:

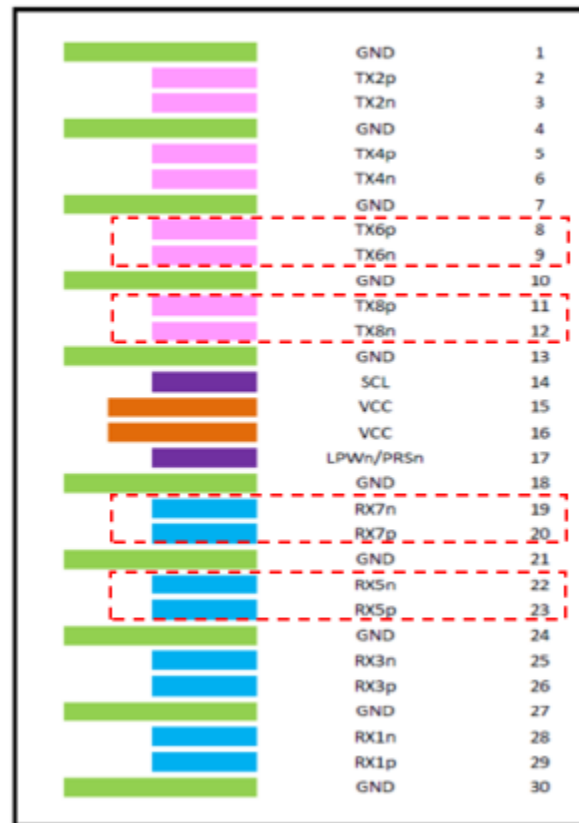
1. Open-drain with pull-up resistor on the host.
2. See pin description of OSFP MSA for required circuit.

Electrical Pad Layout

Top Side (viewed from top)



Bottom Side (viewed from bottom)



Block Diagram

Switch ASIC
400GAUI-4
Interface

OSFP CONNECTOR PIN NAMES

RX1
RX2
RX3
RX4

TX4
TX3
TX2
TX1

Single
8 x 100G
PAM4 CDR
Or
Dual
4x100G
PAM4 CDR

Optical receiver 1

Optical receiver 2

Optical receiver 3

Optical receiver 4

Optical transmitter 4

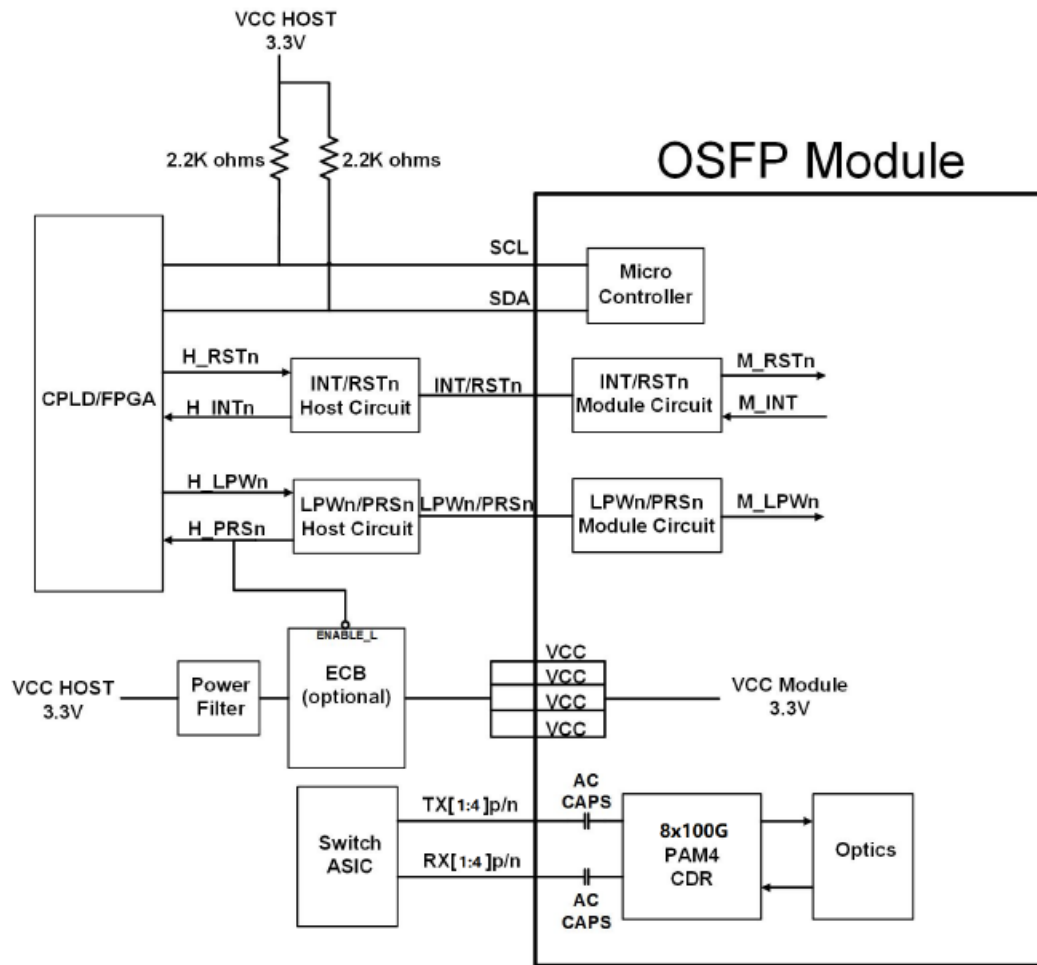
Optical transmitter 3

Optical transmitter 2

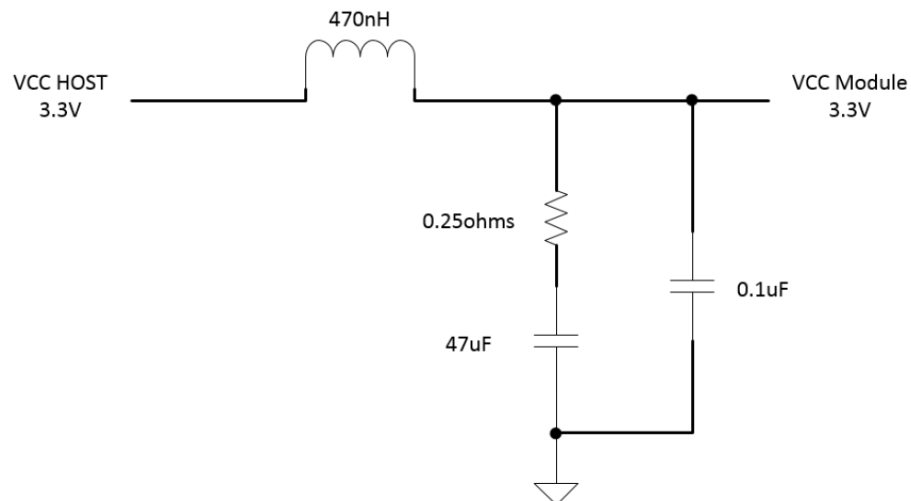
Optical transmitter 1

MPO CONNECTOR

Recommended Application Interface Block Diagram



Recommended Host Board Power Supply Filter Network



About Skylane Optics

Skylane is a leading provider of transceivers for optical communication.

We offer an extensive portfolio for the enterprise, access, datacenter and metropolitan fiber optical market as well as for smart home applications and home networks.

We cover the European, South American and North American market with a strong partner network and have offices in Belgium, Brazil, Sweden and USA.

Our offerings are characterized by high quality and performance. In combination with our strong technical support, we enable our customers to build cost optimized network solutions.

We offer an extensive range of high-quality products including transceivers (Optical and copper), Active Optical Cable (AOC), Direct Attach Cable (DAC), Mux/Demux, Coding Box.

