400G Single-port NDR OSFP Multimode SR4 50m Transceiver

Features

- IB and ETH support

- 400G SR4 multimode

- 4-channels of 100G-PAM4 electrical and optical modulation

- Flat top OSFP connector shell

- 850nm VCSEL

- Maximum reach:30m using OM3 fiber / 50m using OM4 fiber

- Single MPO-12/APC optical connector

- Operates as a 200Gb/s NDR200 transceiver with 2-fiber splitter ends

- 9 Watts (max) using 4-channels

- 6.5 Watts (max) using 2-channels

- Single 3.3V power supply

- Class 1 laser safety

- Hot pluggable, RoHS compliant

- OSFPmsa.org compliant

- CMIS 4.0 compliant

- Case temperature range 0°C to +70°C

Applications

- Used in ConnectX-7/OSFP adapters linked to Twin-port transceivers in 2x400G IB/EN switches

Description

The OSFP-400G-SR4H is an InfiniBand (IB) and Ethernet (ETH) 400Gb/s, Single-port, OSFP, SR4 multimode parallel transceiver using a single, 4-channel MPO-12/APC optical connector. The Short Reach 4-channel (SR4) design uses 100G-PAM4 modulation and has a maximum fiber reach of 50-meters using OM4 multimode fiber and assumes two optical patch panels in the link. It has identical design and internals as the QSFP112 version, only with different connector shells.

The transceiver firmware supports both InfiniBand and Ethernet and is automatically enabled depending on the protocol of the switch attached to. The OSFP shell has a flat-top and utilizes the riding heat sink (cooling fins) on the ConnectX-7 connector cage.

When linked to 1:2 splitter fiber cable split end has only 2 channels and will activate only 2-channels in the 400G transceiver automatically creating a 200G speed and reducing power.

Multimode optics is denoted by a tan-colored pull tab and Magenta-colored optical fiber. Aqua green plastic shell on the MPO-12/APC optical connector denotes Angled Polish Connector and is not compatible with Ultra-flat Polished Connectors (UPC) (aqua colored).

The Single-port and Twin-port transceiver combinations guarantee optimal operation. Rigorous production testing ensures the best out-of-the-box installation experience, performance, and durability.

Absolute Maximum Specifications

Absolute maximum ratings are those beyond which damage to the device may occur.

Prolonged operation between the operational specifications and absolute maximum ratings is not intended and may cause permanent device degradation.

Table1-Absolute Maximum Specifications

Parameter	Min.	Typical	Max.	Unit	Note
Storage Temperature	-40		+85	ºC	
Supply voltage	-0.5		3.6	V	
Relative Humidity (non- condensing)	5		95	%	
Control input voltage	-0.3		Vcc+0.5	V	
Operating Case Temperature	0		70	ºC	

Recommended Operating Conditions and Power Supply Requirements

Table2-Recommended Operating Conditions and Power Supply Requirements

Parameter	Symbol	Min	Typical	Max.	Units
Power Supply Voltage	VCC	3.135	3.3	3.465	V
Instantaneous peak current at hot plug (400G)	ICC_IP	-	-	3600	mA

Sustained peak current at hot plug (400G)	ICC_SP	-	-	3000	mA
Maximum Power consumption (400G)	PD	-	-	9	W
Maximum Power consumption, Low Power Mode (400G)	PDLP	-	-	1.5	W
Instantaneous peak current at hot plug (200G)	ICC_IP	-	-	2200	mA
Sustained peak current at hot plug (200G)	ICC_SP	-	-	1840	mA
Maximum Power consumption (200G)	PD	-	-	5.5	W
Maximum Power consumption, Low Power Mode (200G)	PDLP	-	-	1.5	W
Signaling Rate per Lane	SRL	-	53.125	-	GBd
Two Wire Serial Interface Clock Rate	-	-	-	400	kHz
Power Supply Noise Tolerance (10Hz - 10MHz)	-	66	-		mV
Rx Differential Data Output Load	-	-	100	-	Ohm
Operating distance (OM3)		2		30	m
Operating distance (OM4)		2		50	m

Electrical Specifications

Table3-Electrical Specifications					
Parameter	Min.	Typical	Max.	Unit	Note
Receiver					
AC common-mode output Voltage (RMS)	-	-	25	mV	
Differential output Voltage (Long mode)	-	-	845	mV	
Differential output Voltage (Short mode)	-	-	600	mV	
Near-end Eye height, differential	70	-	-	mV	
Far-end Eye height, differential	30	-	-	mV	
Far end pre-cursor ratio	-4.5	-	2.5	%	
Differential Termination Mismatch	-	-	10	%	
Transition Time (min, 20% to 80%)	9.5	-	-	ps	
DC common mode Voltage	-350	-	2850	mV	
Transceiver					
Differential pk-pk input Voltage	750	-	-	mV	

tolerance					
Differential termination mismatch	-	-	10	%	
Single-ended voltage tolerance range	-0.4	-	3.3	V	
DC common mode Voltage	-350	-	2850	mV	

Electrical Specification for Low Speed Signal

Table4-Electrical Specification for Low Speed Signal

Parameter	Symbol	Min.	Max	Units
Module output SCL and SDA	VOL	0	0.4	V
	VOH	VCC-0.5	VCC+0.3	V
Module Input SCL and SDA	VIL	-0.3	VCC*0.3	V
	VIH	VCC*0.7	VCC+0.5	V

Optical Specifications

Table5-Optical Specifications

Parameter	Symbol	Min.	Typical	Max.	Unit	Note
Transceiver						
Wavelength	yC	844	850	863	nm	
RMS spectral width	Dl			0.6		
Average Launch Power, each lane	AOPL	-4.6	-	4.0	dBm	1
Outer Optical Modulation Amplitude (OMAouter), each lane (min)	TOMA	-2.6		3.5	dBm	2
Transmitter and Dispersion Eye Closure for PAM4 (TDECQ), each lane	TDECQ	-	-	4.4	dB	
Average Launch Power of OFF Transmitter, each lane	TOFF	-	-	-30	dBm	
Extinction Ratio, each lane	ER	-	2.5		dB	
RIN21.4OMA	RIN	-	-	-132	dB/Hz	
Optical Return Loss Tolerance	ORL	-	-	12	dB	
Transmitter Reflectance	TR	-	-	-26	dB	3
Receiver						
Wavelength	λ C	842	850	863	nm	
Damage Threshold, average optical power, each lane	AOPD	5	-	-	dBm	
Average Receive Power, each lane	AOPR	-6.3	-	4.0	dBm	6
Receive Power (OMAouter), each lane	OMA-R	-	-	3.5	dBm	
Receiver Reflectance	RR	-	-	-26	dB	
Receiver Sensitivity (OMAouter),	SOMA	-	-	-4.4	dBm	4

each lane							
Stressed Receiver Sensitivity (OMAouter), each lane	SRS	-	-	-1.8	dBm	5	
Conditions of stressed receiver sensitivity test							
Stressed eye closure for PAM4	SECQ		4.4		dB		
OMAouter of each aggressor lane	OMAouter		3.5		dBm		

Notes：

[1] Average launch power, each lane (min) is informative and not the principal indicator signal strength.

[2] Even if max(TECQ,TDECQ) ← 1.8dB, OMAouter (min) must exceed this value.

[3] Transmitter reflectance is defined looking into the transmitter.

[4] Receiver sensitivity (OMAouter), each lane (max) is informative and is defined for a transmitter with TDECQ←=1.8 dB

[5] Measured with conformance test signal at TP3 for the BER = 2.4x10-4

Minimum power is informative. AOP above the minimum does not ensure compliance

Connectivity Scenarios

The transceiver is inserted into 400Gb/s ConnectX-7/OSFP-based, PCIe-bus network cards. Typically, the transceiver is linked to a single 800Gb/s Twin-port 2x400G OSFP transceiver in a Quantum-2 InfiniBand or Spectrum-4 Ethernet switch.   The 400Gb/s transceiver has two speeds depending on the number of fibers attached:

1. 400Gb/s mode: Using 4-channels straight 50-meter crossover fiber cables , the transceiver draws 9 Watts maximum or 8 Watts typical. In this case, the Twin-port 2x400G transceiver supports two 400G transceivers and two ConnectX-7/OSFP adapter cards.

2. 200Gb/s mode: Using 2-channels and 1:2 splitter 50-meter crossover fiber cables fiber cables , the transceiver operates at 200Gb/s (200GbE, NDR200) rate and draws 5 Watts typical and 6.5 Watts maximum automatically reducing power as only 2 channels are activated. This case creates links to four 200Gb/s ConnectX-7/OSFP adapter cards.

Notes:

[1] Single port OSFP are not for use in switches. BlueField-3 only accepts QSFP112s

[2] Both fibers in the Twin-port 2x400G transceiver linked to the QSFP112s must be the same type – straight or splitter and cannot be mixed.

Pin Description

The device is OSFP MSA Specification for OSFP Octal Small Form Factor Pluggable Module Rev. 1.12 compliant, see www.osfpmsa.org.

Table6-Pin Description						
Pin	Symbol	Description	Pin	Symbol	Description
1	GND	Ground	31	GND	Ground
2	Tx2p	Transmitter Non-Inverted Data Input	32	Rx2p	Receiver Non-Inverted Data Output
3	Tx2n	Transmitter Inverted Data Input	33	Rx2n	Receiver Inverted Data Output

4	GND	Ground	34	GND	Grounds
5	Tx4p	Transmitter Non-Inverted Data Input	35	Rx4p	Receiver Non-Inverted Data Output
6	Tx4n	Transmitter Inverted Data Input	36	Rx4n	Receiver Inverted Data Output
7	GND	Ground	37	GND	Ground
8	Tx6p	Transmitter Non-Inverted Data Input	38	Rx6p	Receiver Non-Inverted Data Output
9	Tx6n	Transmitter Inverted Data Input	39	Rx6n	Receiver Inverted Data Output
10	GND	Ground	40	GND	Ground
11	Tx8p	Transmitter Non- Inverted Data input	41	Rx8p	Receiver Non-Inverted Data Output
12	Tx8n	Transmitter Inverted Data Input	42	Rx8n	Receiver Inverted Data Output
13	GND	Ground	43	GND	Ground
14	SCL	2-wire serial interface clock	44	INT / RSTn	Module Interrupt / Module Reset
15	VCC	+3.3V Power	45	VCC	+3.3V Power
16	VCC	+3.3V Power	46	VCC	+3.3V Power
17	LPWn / PRSn	Low-Power Mode / Module Present	47	SDA	2-wire Serial interface data
18	GND	Ground	48	GND	Ground
19	Rx7n	Receiver Inverted Data Output	49	Tx7n	Transmitter Inverted Data Input
20	Rx7p	Receiver Non-Inverted Data Output	50	Tx7p	Transmitter Non-Inverted Data Input
21	GND	Ground	51	GND	Ground
22	Rx5n	Receiver Inverted Data Output	52	Tx5n	Transmitter Inverted Data Input
23	Rx5p	Receiver Non-Inverted Data Output	53	Tx5p	Transmitter Non-Inverted Data Input
24	GND	Ground	54	GND	Ground
25	Rx3n	Receiver Inverted Data Output	55	Tx3n	Transmitter Inverted Data Input
26	Rx3p	Receiver Non-Inverted Data Output	56	Tx3p	Transmitter Non-Inverted Data Input
27	GND	Ground	57	GND	Ground
28	Rx1n	Receiver Inverted Data Output	58	Tx1n	Transmitter Inverted Data Input
29	Rx1p	Receiver Non-Inverted Data Output	59	Tx1p	Transmitter Non-Inverted Data Input
30	GND	Ground	60	GND	Ground

OSFP Module Pad Layout
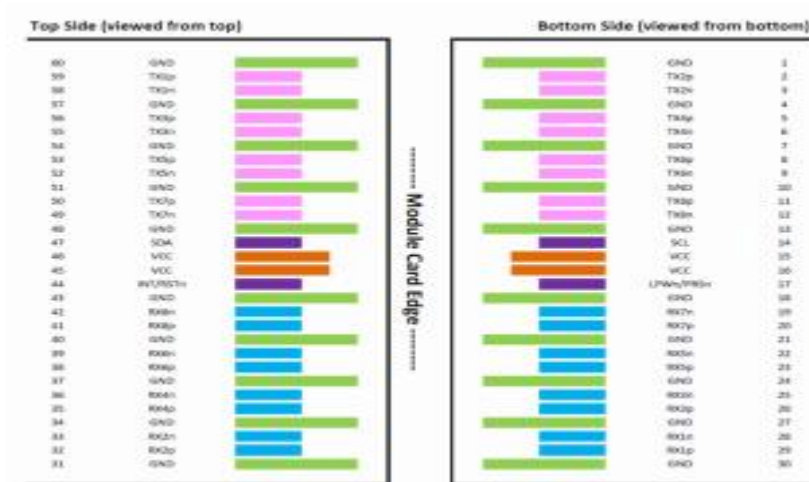
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