

OSFP-400G-DR4+

400G OSFP DR4 Transceiver

Hot Pluggable, +3.3V, MPO, 1310nm, SMF, 2km, Commercial Temperature

FEATURES

- Compliant with IEEE 802.3-2022: 400GBASE-DR4 optical interface
- Compliant with IEEE 802.3ck-2022: 400GAUI-4/200GAUI-2/100GAUI-1 C2M electrical interface
- Supports 4x100G Ethernet
- Compliant with OSFP RHS
- Compliant with CMIS Rev 5.2
- Two wire serial Interface with digital diagnostic monitoring
- Complies with EU Directive 2011/65/EU (RoHS compliant)
- Class 1 Laser
- Commercial Operating Temperature Range: 0 to 70°C

ABSOLUTE MAXIMUM RATINGS

Parameter	Symbol	Min.	Max.	Unit
Storage Temperature	T _s	-40	85	°C
Supply Voltage	V _{CC}	-0.5	3.6	V
Relative Humidity (non-condensing)	RH	5	95	%
Data Input Voltage Differential	V _{DIP} -V _{DIN}	-	1	V
Control Input Voltage	V _I	-0.3	V _{CC} +0.5	V
Control Output Current	I _O	-20	20	mA

RECOMMENDED OPERATING ENVIRONMENT

Parameter	Symbol	Min.	Typical	Max.	Unit	Note
Operating Case Temperature	T_{OPR}	0	-	70	°C	
Power Supply Voltage	V_{CC}	3.135	3.3	3.465	V	
Instantaneous peak current at hot plug	I_{CC_IP}	-	-	3600	mA	
Sustained peak current at hot plug	I_{CC_SP}	-	-	2997	mA	
Maximum Power Dissipation	P_D	-	-	9	W	
Maximum Power Dissipation, Low Power Mode	P_{DLP}	-	-	2	W	
Signalling Speed per Lane	DRL	-	53.125	-	GBd	
Control Input Voltage High	V_{IH}	$V_{CC} \cdot 0.7$	-	$V_{CC} + 0.3$	V	
Control Input Voltage Low	V_{IL}	-0.3	-	$V_{CC} \cdot 0.3$	V	
Two Wire Serial Interface Clock Rate		-	-	400	kHz	
Power Supply Noise 1 kHz - 1 MHz (p-p)		-	-	66	mVpp	
Operating Distance		2	-	2000	m	

OPTICAL PARAMETERS

Parameter	Symbol	Min	Typical	Max	Unit	Notes
TRANSMITTER						
Wavelength	λ_c	1304.5	1311	1317.5	nm	
Side Mode Suppression Ratio	SMSR	30	-	-	dB	
Average Launch Power, each lane	AOP _L	-2.9	-	4.0	dBm	1
Outer Optical Modulation Amplitude (OMA _{outer}), each Lane	T _{OMA}	-0.8	-	4.2	dBm	
Launch power in OMA _{outer} minus TDECQ, each lane	T _{OMA-TDECQ}	-2.2	-	-	dBm	
Transmitter and Dispersion Eye Closure for PAM4 (TDECQ), each lane	TDECQ	-	-	3.4	dB	
TDECQ – 10log10(Ceq), each lane	-	-	-	3.4	dB	
Average Launch Power of OFF Transmitter, each lane	T _{OFF}	-	-	-15	dBm	
Extinction Ratio	ER	3.5	-	-	dB	
Transmitter transition time	Tr			17	ps	
RIN _{21.4OMA}	RIN	-	-	-136	dB/Hz	
Optical return loss tolerance	ORL	-	-	21.4	dB	
Transmitter Reflectance	T _R	-	-	-26	dB	2
RECEIVER						
Wavelength	λ_c	1304.5	1311	1317.5	nm	
Damage Threshold, each Lane	AOP _D	5	-	-	dBm	
Average Receive Power, each Lane	AOP _R	-5.9	-	4	dBm	
Receive Power (OMA _{outer}), each Lane	OMA _R	-	-	4.2	dBm	
Receiver Reflectance	RR	-	-	-26	dB	
Receiver Sensitivity (OMA _{outer}), each Lane	S _{OMA}	-	-	Max (-3.9, SECQ – 5.3)	dBm	3
Stressed Receiver Sensitivity (OMA _{outer}), each Lane	SRS	-	-	-1.9	dBm	4
CONDITIONS OF STRESSED RECEIVER SENSITIVITY TEST						
Stressed eye closure for PAM4 (SECQ), lane under test	SECQ	-	3.4	-	dB	
SECQ – 10log10(Ceq), lane under test	Ceq	-	-	3.4	dB	
OMA _{outer} of each aggressor lane	-	-	4.2	-	dBm	

Note:

1. Average launch power, each lane (min) is informative and not the principal indicator of signal strength
2. Transmitter reflectance is defined looking into the transmitter.
3. Receiver sensitivity (OMA_{outer}), each lane (max) is informative and is defined for a transmitter with a value of SECQ up to 3.4dB.
4. Measured with conformance test signal at TP3 for the BER = 2.4x10⁻⁴

ELECTRICAL CHARACTERISTICS (High Speed Signal - Compliant with IEEE802.3ck C2M)

Parameter	Symbol	Min	Typical	Max	Unit	Note
TRANSMITTER (Module Input, TP1)						
Differential pk-pk input Voltage tolerance (TP1a)	-	750	-	-	mV	
Peak-to-peak AC common-mode voltage tolerance Low-frequency, VCMLF Full-band, VCMFB	-	-	-	32 80	mV	
Differential-mode to common-mode return loss	RLcd	802.3ck 120G-2			dB	
Effective return loss	ERL	8.5	-	-	dB	
Differential termination mismatch	-	-	-	10	%	
Single-ended voltage tolerance range	-	-0.4	-	3.3	V	
DC common-mode voltage tolerance	-	-0.35	-	2.85	V	
RECEIVER (Module Output, TP4)						
Peak-to-peak AC common-mode voltage Low-frequency, VCMLF Full-band, VCMFB	-	-	-	32 80	mV	
Differential peak-to-peak output voltage Short mode Long mode	-	-	-	600 845	mV	
Eye height	EH	15	-	-	mV	
Vertical eye closure	VEC	-	-	12	dB	
Common-mode to differential-mode return loss	RLDc	802.3ck 120G-1			dB	
Effective return loss	ERL	8.5	-	-	dB	
Differential termination mismatch	-	-	-	10	%	
Transition time	-	8.5	-	-	ps	
DC common-mode voltage tolerance	-	-0.35	-	2.85	V	

ELECTRICAL CHARACTERISTICS (Low Speed Control and Sense Signals)

Parameter	Symbol	Min.	Max.	Unit
Module output SCL and SDA	V_{OL}	0	0.4	V
Module Input SCL and SDA	V_{IL}	-0.3	$V_{CC} \cdot 0.3$	V
	V_{IH}	$V_{CC} \cdot 0.7$	$V_{CC} + 0.5$	V
InitMode, ResetL and ModSelL	V_{IL}	-0.3	0.8	V
	V_{IH}	2	$V_{CC} + 0.3$	V
IntL	V_{OL}	0	0.4	V
	V_{OH}	$V_{CC} - 0.5$	$V_{CC} + 0.3$	V

PIN ASSIGNMENT

Top Side (viewed from top)

60	GND	
59	TX1p	
58	TX1n	
57	GND	
56	TX3p	
55	TX3n	
54	GND	
53	TX5p	
52	TX5n	
51	GND	
50	TX7p	
49	TX7n	
48	GND	
47	SDA	
46	VCC	
45	VCC	
44	INT/RSTn	
43	GND	
42	RX8n	
41	RX8p	
40	GND	
39	RX6n	
38	RX6p	
37	GND	
36	RX4n	
35	RX4p	
34	GND	
33	RX2n	
32	RX2p	
31	GND	

Bottom Side (viewed from bottom)

	GND	1
	TX2p	2
	TX2n	3
	GND	4
	TX4p	5
	TX4n	6
	GND	7
	TX6p	8
	TX6n	9
	GND	10
	TX8p	11
	TX8n	12
	GND	13
	SCL	14
	VCC	15
	VCC	16
	LPWn/PRSn	17
	GND	18
	RX7n	19
	RX7p	20
	GND	21
	RX5n	22
	RX5p	23
	GND	24
	RX3n	25
	RX3p	26
	GND	27
	RX1n	28
	RX1p	29
	GND	30

----- Module Card Edge -----

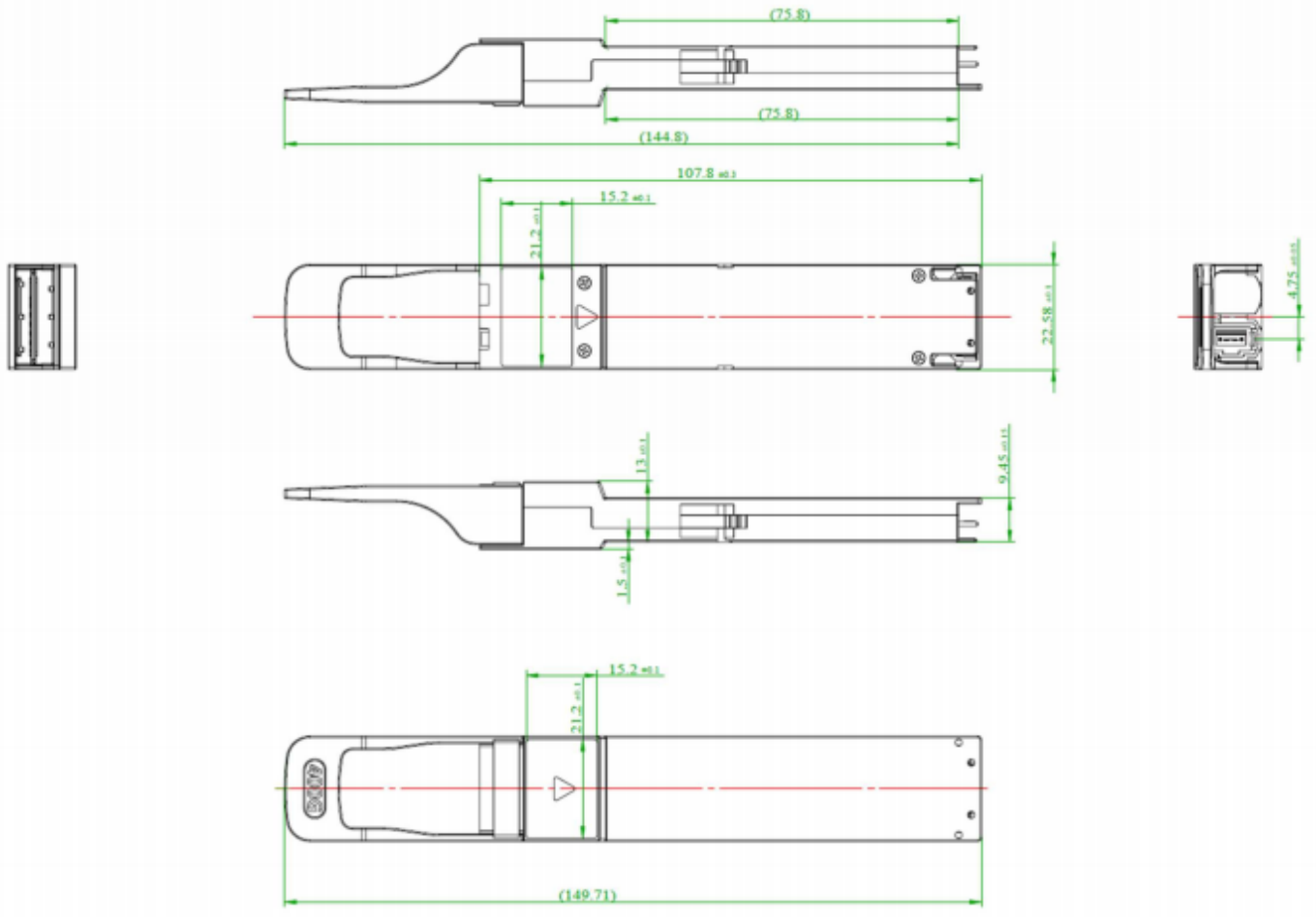
Pinout definitions of OSFP module inputs/outputs

Pin	Logic	Symbol	Description	Note	Pin	Logic	Symbol	Description	Note
1		GND	Ground		31		GND	Ground	
2	CML-I	TX2p	Transmitter Data Non-Inverted		32	CML-O	RX2p	Receiver Data Non-Inverted	
3	CML-I	TX2n	Transmitter Data Inverted		33	CML-O	RX2n	Receiver Data Inverted	
4		GND	Ground		34		GND	Ground	
5	CML-I	TX4p	Transmitter Data Non-Inverted		35	CML-O	RX4p	Receiver Data Non-Inverted	
6	CML-I	TX4n	Transmitter Data Inverted		36	CML-O	RX4n	Receiver Data Inverted	
7		GND	Ground		37		GND	Ground	
8	CML-I	TX6p	Transmitter Data Non-Inverted	1	38	CML-O	RX6p	Receiver Data Non-Inverted	1
9	CML-I	TX6n	Transmitter Data Inverted	1	39	CML-O	RX6n	Receiver Data Inverted	1
10		GND	Ground		40		GND	Ground	
11	CML-I	TX8p	Transmitter Data Non-Inverted	1	41	CML-O	RX8p	Receiver Data Non-Inverted	1
12	CML-I	TX8n	Transmitter Data Inverted	1	42	CML-O	RX8n	Receiver Data Inverted	1
13		GND	Ground		43		GND	Ground	
14	LVCMS- OS- I/O	SCL	2-wire Serial interface clock		44	Multi-Level	INT/RST n	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	Multi-Level	LPWn/P RSn	Low-Power Mode / Module Present		47	LVCMS- OS-I/O	SDA	2-wire Serial interface data	
18		GND	Ground		48		GND	Ground	
19	CML-O	RX7n	Receiver Data Inverted	1	49	CML-I	TX7n	Transmitter Data Inverted	1
20	CML-O	RX7p	Receiver Data Non-Inverted	1	50	CML-I	TX7p	Transmitter Data Non-Inverted	1
21		GND	Ground		51		GND	Ground	
22	CML-O	RX5n	Receiver Data Inverted	1	52	CML-I	TX5n	Transmitter Data Inverted	1
23	CML-O	RX5p	Receiver Data Non-Inverted	1	53	CML-I	TX5p	Transmitter Data Non-Inverted	1
24		GND	Ground		54		GND	Ground	
25	CML-O	RX3n	Receiver Data Inverted		55	CML-I	TX3n	Transmitter Data Inverted	
26	CML-O	RX3p	Receiver Data Non-Inverted		56	CML-I	TX3p	Transmitter Data Non-Inverted	
27		GND	Ground		57		GND	Ground	
28	CML-O	RX1n	Receiver Data Inverted		58	CML-I	TX1n	Transmitter Data Inverted	
29	CML-O	RX1p	Receiver Data Non-Inverted		59	CML-I	TX1p	Transmitter Data Non-Inverted	
30		GND	Ground		60		GND	Ground	

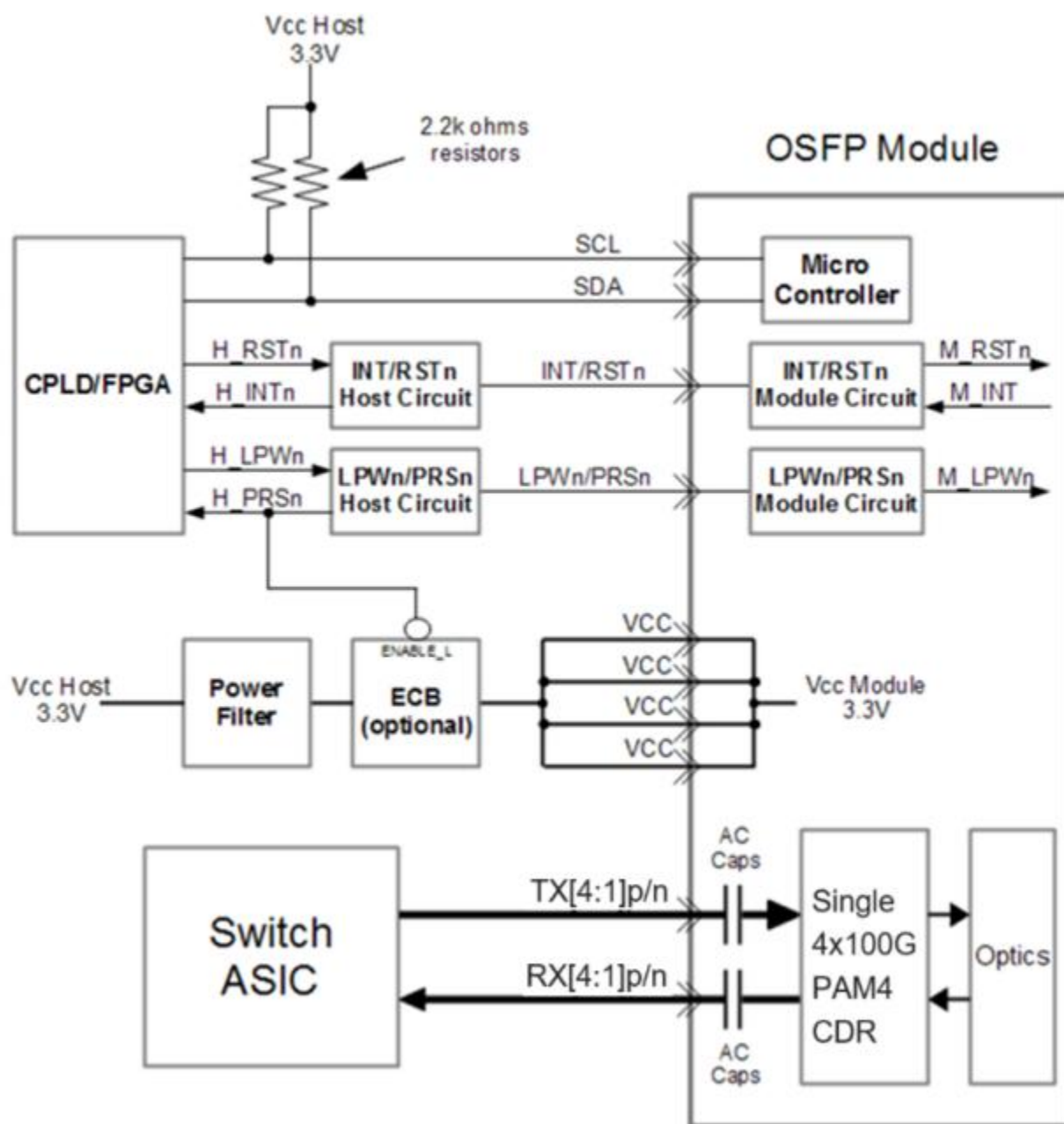
Note:

1. Not used

MECHANICAL DIMENSIONS (UNIT: mm)



RECOMMENDED HOST BOARD



Recommended OSFP Host Board Schematic

DIGITAL DIAGNOSTICS

Parameter	Range	Accuracy	Unit	Calibration
Temperature	0 to 70	±3	°C	Internal
Voltage	0 to V _{CC}	0.1	V	Internal
Tx Bias Current (Each Lane)	0 to 100	10%	mA	Internal
Tx Output Power (Each Lane)	-2.9 to +4	±3	dB	Internal
Rx Receive Power (Each Lane)	-5.9 to +4	±3	dB	Internal