

400G OSFP DR4 Transceiver CC-OSFP04DR4-12C

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
- Compliant with OSFP MSA Specification Rev 5.1 RHS housing(type2) with MPO-12/APC receptacle
- Compliant with CMIS Rev 5.0
- Case operating temperature 0°C to 70°C
- Two wire serial Interface with digital diagnostic monitoring
- Complies with EU Directive 2011/65/EU (RoHS compliant)
- Class 1 Laser



Absolute Maximum Ratings

Parameter	Symbol	Min	Typ	Max	Unit	Notes.
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 Conditions

Parameter	Symbol	Min.	Typ.	Max.	Unit	Notes
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} *0.7	-	V _{CC} +0.3	V	
Control Input Voltage Low	V _{IL}	-0.3	-	V _{CC} *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	-	500	m	

400G OSFP DR4 Transceiver CC-OSFP04DR4-12C

Optical Transmitter Characteristics

Parameter	Symbol	Min.	Typ.	Max.	Unit	Notes
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	T _r			17	ps	
RIN _{21.4OMA}	RIN	-	-	-136	dB/Hz	
Optical return loss tolerance	ORL	-	-	21.4	dB	
Transmitter Reflectance	T _R	-	-	-26	dB	2

Note 1: Average launch power, each lane (min) is informative and not the principal indicator of signal strength

Note 2: Transmitter reflectance is defined looking into the transmitter.

Optical Receiver Characteristics

Parameter	Symbol	Min.	Typ.	Max.	Unit	Notes
Wavelength	λ_{CO}	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	1
Stressed Receiver Sensitivity (OMA _{outer}), each Lane	SRS	-	-	-1.9	dBm	2
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: Receiver sensitivity (OMA_{outer}), each lane (max) is informative and is defined for a transmitter with a value of SECQ up to 3.4 dB.

Note 2: Measured with conformance test signal at TP3 for the BER = 2.4x10⁻⁴

400G OSFP DR4 Transceiver CC-OSFP04DR4-12C

Electrical Specification High Speed Signal (compliant with IEEE802.3ck C2M)

Receiver (Module Output, TP4)

Parameter	Symbol	Min.	Typ.	Max.	Unit	Notes
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	

Transmitter (Module Input, TP1)

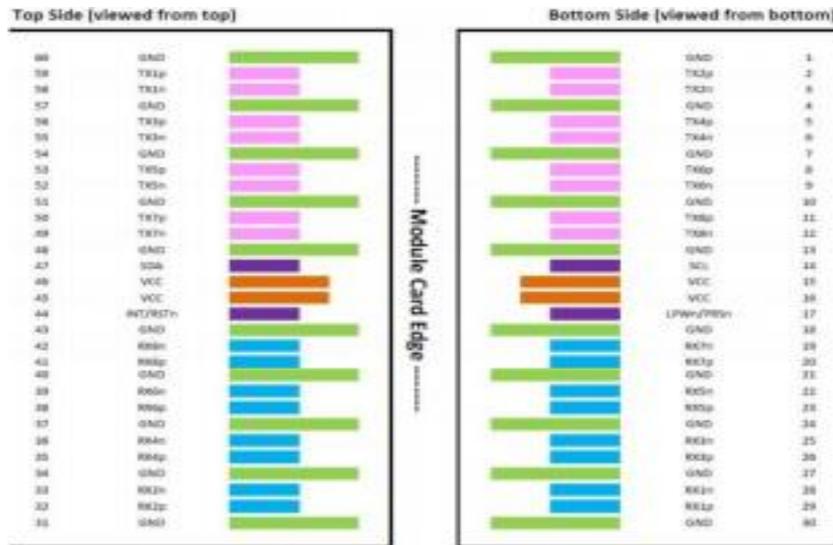
Parameter	Symbol	Min.	Typ.	Max.	Unit	Notes
Differential pk-pk input Voltage tolerance (TP1a)	-	750	-	-	mV	
Peak-to-peak AC common-mode voltage tolerance Low-frequency, VCMLF Full-band, VCMFB	-	32 80	-	-	mV	
Differential-mode to common-mode return loss	RLcd	802.3ck 120G-2			dB	
Effective return loss	ERL	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	

Electrical Specification Low Speed Control and Sense Signals

Parameter	Symbol	Min.	Max.	Unit	Notes
Module output SCL and SDA	V_{OL}	0	0.4	V	
Module Input SCL and SDA	V_{IL}	-0.3	$V_{CC} * 0.3$	V	
	V_{IH}	$V_{CC} * 0.7$	$V_{CC} + 0.5$	V	
INT/RSTn	Comply with OSFP MSA 5.1 Table 14-4				

400G OSFP DR4 Transceiver CC-OSFP04DR4-12C

Pin Assignment



Pin Description

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

400G OSFP DR4 Transceiver CC-OSFP04DR4-12C

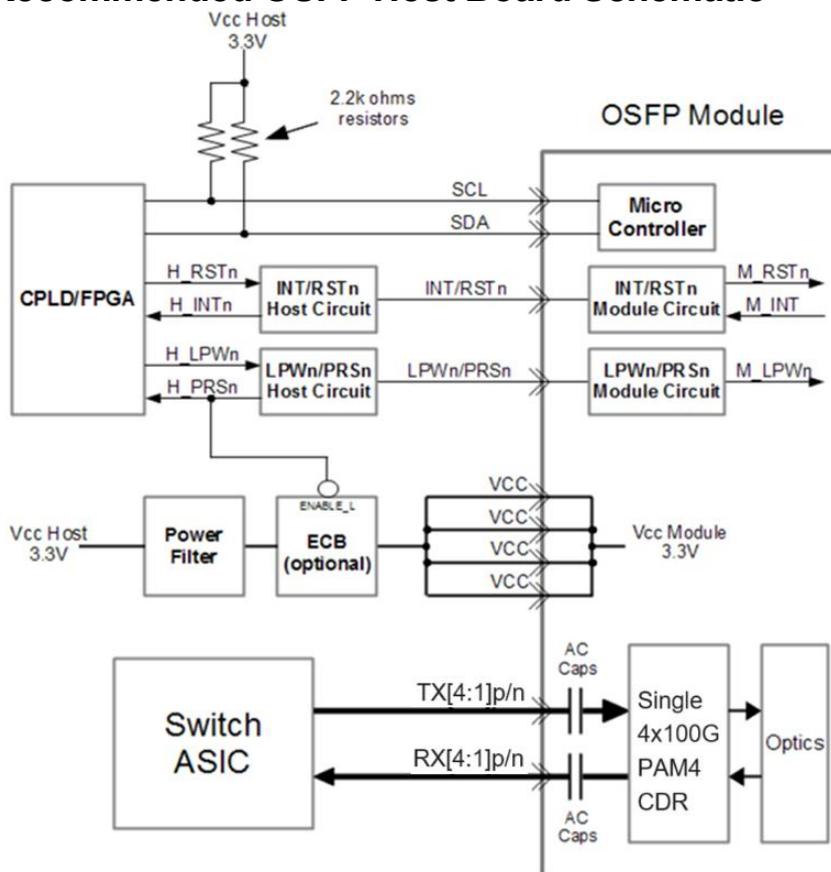
19	RX7n	Receiver Data Inverted	CML-O	1
20	RX7p	Receiver Data Non-Inverted	CML-O	1
21	GND	Ground		
22	RX5n	Receiver Data Inverted	CML-O	1
23	RX5p	Receiver Data Non-Inverted	CML-O	1
24	GND	Ground		
25	RX3n	Receiver Data Inverted	CML-O	
26	RX3p	Receiver Data Non-Inverted	CML-O	
27	GND	Ground		
28	RX1n	Receiver Data Inverted	CML-O	
29	RX1p	Receiver Data Non-Inverted	CML-O	
30	GND	Ground		
31	GND	Ground		
32	RX2p	Receiver Data Non-Inverted	CML-O	
33	RX2n	Receiver Data Inverted	CML-O	
34	GND	Ground		
35	RX4p	Receiver Data Non-Inverted	CML-O	
36	RX4n	Receiver Data Inverted	CML-O	
37	GND	Ground		
38	RX6p	Receiver Data Non-Inverted	CML-O	1
39	RX6n	Receiver Data Inverted	CML-O	1
40	GND	Ground		
41	RX8p	Receiver Data Non-Inverted	CML-O	1
42	RX8n	Receiver Data Inverted	CML-O	1
43	GND	Ground		
44	INT/RSTn	Module Interrupt / Module Reset	Multi-Level	
45	VCC	+3.3V Power		
46	VCC	+3.3V Power		
47	SDA	2-wire Serial interface data	LVCMOS-I/O	
48	GND	Ground		
49	TX7n	Transmitter Data Inverted	CML-I	1
50	TX7p	Transmitter Data Non-Inverted	CML-I	1
51	GND	Ground		
52	TX5n	Transmitter Data Inverted	CML-I	1
53	TX5p	Transmitter Data Non-Inverted	CML-I	1

400G OSFP DR4 Transceiver CC-OSFP04DR4-12C

54	GND	Ground		
55	TX3n	Transmitter Data Inverted	CML-I	
56	TX3p	Transmitter Data Non-Inverted	CML-I	
57	GND	Ground		
58	TX1n	Transmitter Data Inverted	CML-I	
59	TX1p	Transmitter Data Non-Inverted	CML-I	
60	GND	Ground		

Notes 1: Not use.

Recommended OSFP Host Board Schematic

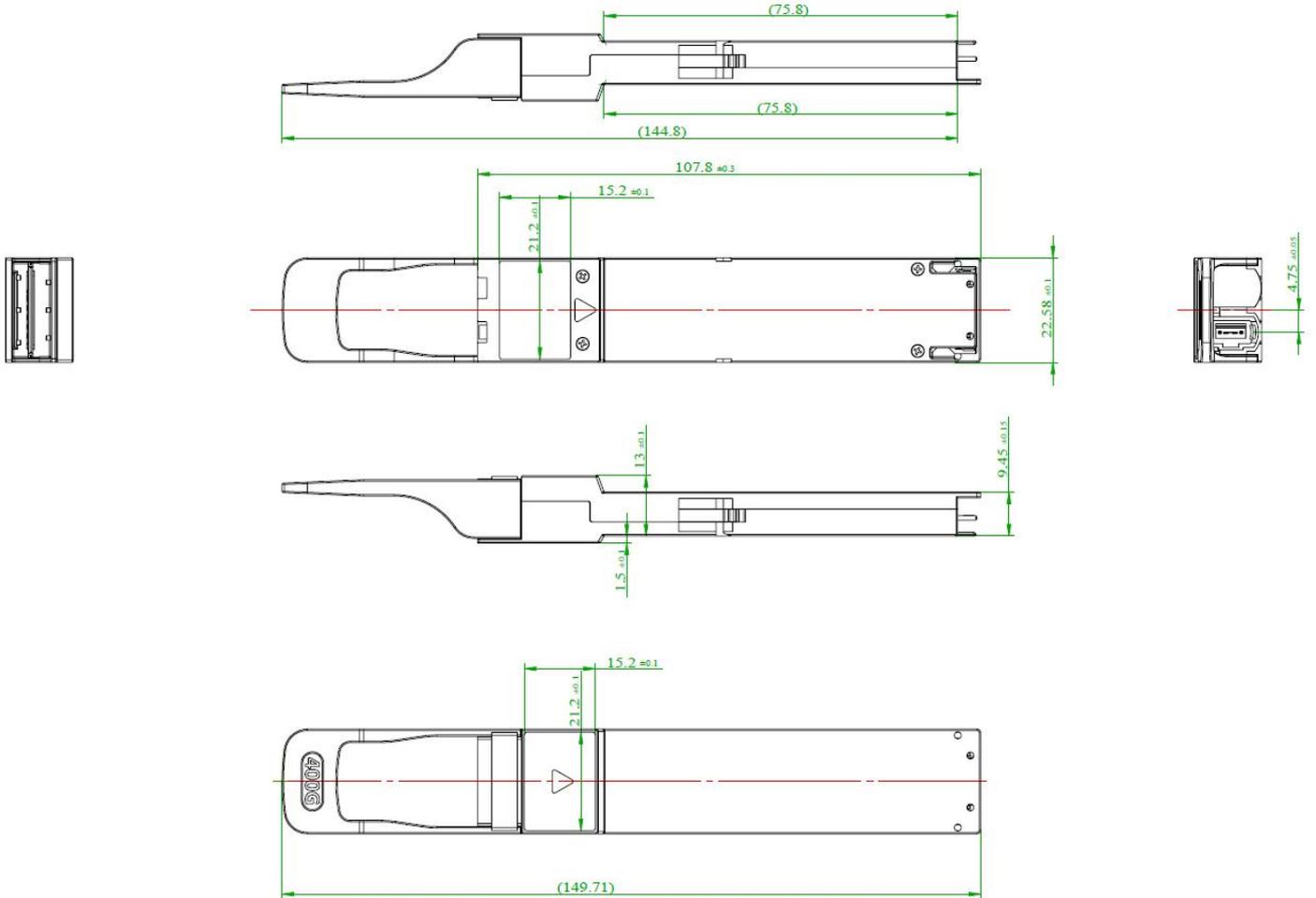


Digital Diagnostic Monitor Accuracy

Parameter	Accuracy	Unit
Internally measured transceiver temperature	+/-3	deg.C
Internally measured transceiver supply voltage	+/-3	%
Measured Tx bias current	+/-10	%
Measured Tx output power	+/-3	dB
Measured Rx received average optical power	+/-3	dB

400G OSFP DR4 Transceiver CC-OSFP04DR4-12C

Mechanical Diagram



Appendix A Document Revision

Version No.	Date	Description
V1.0	2023-12-17	First released