400G OSFP SR4 Transceiver
CC-OSFP04SR4-12D

Features

- Hot-pluggable OSFP400G SR4 multimode transceiver
- Compliant with OSFP RHS
- Compliant with CMIS Rev 5.0and above revision
- 4-channels of 100G-PAM4 electrical and optical modulation
- Maximum power consumption 8.5W with 4 channels and 6.5W with 2 channels
- Single MPO-12 APC receptacles
- Up to 70m reach on OM3 and 100m reach on OM4
- Operates as a 200Gb/s NDR200 transceiver with 2-fiber splitter ends
- Case operating temperature 0°C to 70°C

Applications

- InfiniBand NDR
- 400G SR4 applications with FEC
- 4 x 100GbE breakout application

Description

CC-OSFP04SR4-12D OSFP transceiver modules are designed for use in 400 Gigabit Ethernet or InfiniBand links up to 100m multi-mode fiber. They are compliant with the OSFP MSA, IEEE P802.3db/D3.0 and IEEE P802.3ck . Digital diagnostic functions are available via the I2C interface, as specified by the OSFP MSA. The optical transceiver is RoHS compliant as described in Application Note AN-2038

Absolute Maximum Ratings

Parameter	Symbol	Min	Max	Unit	Notes
Storage Temperature	T_S	-40	85	ºC	
Supply Voltage	V_{CC}	-0.5	3.6	V	
Relative Humidity (non-condensing)	RH	5	95	%	
Control Input Voltage	V_I	-0.3	V_{CC}+0.5	V	

Recommended Operating Conditions (T=25°C,unless noted)

Parameter	Symbol	Min.	Typical	Max.	Unit	Notes
Operating Case Temperature	T_{OPR}	0	-	70	ºC	
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}	-	-	3000	mA	
Maximum Power Dissipation(400G)	P_D	-	-	8.5	W	
Maximum Power Dissipation(200G)	P_D	-	-	6.5	W	
Maximum Power Dissipation, Low Power Mode	P_{DLP}	-	-	1.5	W	
Signaling Rate per Lane	SRL	-	53.125	-	GBd	PAM4
I2C Clock Rate	-	-100	-	400	kHz	
Power Supply Noise Tolerance (10Hz - 10MHz)	-	-	-	66	mV	
Rx Differential Data Output Load	-	-	100	-	Ohm	
Operating Distance (OM3)	-	2	-	70	m	
Operating Distance (OM4)	-	2	-	100	m	

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CC-OSFP04SR4-12D

Transmitter Optical Specifications

Parameter	Symbol	Min.	Typical	Max.	Unit	Notes
Wavelength	λ_C	844	850	863	nm	
RMS spectral width	$\Delta\lambda_{rms}$			0.6	nm	
Average Launch Power, each lane	AOP_L	-4.6	-	4.0	dBm	1
Outer Optical Modulation Amplitude (OMA_{outer}), each lane	T_{OMA}	-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	T_{OFF}	-	-	-30	dBm	
Extinction Ratio, each lane	ER	2.5		-	dB	
$RIN_{21.4}OMA$	RIN	-	-	-132	dB/Hz	
Optical Return Loss Tolerance	ORL		-	12	dB	
Transmitter Reflectance	T_R	-	-	-26	dB	3

Notes
1.Average launch power, each lane (min) is informative and not the principal indicator of signal strength.
2.Even if max (TECQ, TDECQ) < 1.8dB, OMA_{outer} (min) must exceed this value.
3.Transmitter reflectance is defined looking into the transmitter.

Receiver Optical Specifications (T=25°C, unless noted)

Parameter	Symbol	Min.	Typical	Max.	Unit	Notes
Wavelength	λ_C	842	850	863	nm	
Damage Threshold, average optical power, each lane	AOP_D	5	-	-	dBm	
Average Receive Power, each lane	AOP_R	-6.3	-	4.0	dBm	
Receive Power (OMA_{outer}), each lane	OMA_R	-	-	3.5	dBm	
Receiver Reflectance	RR	-	-	-26	dB	
Receiver Sensitivity (OMA_{outer}), each lane	S_{OMA}	-	-	-4.4	dBm	1
Stressed Receiver Sensitivity (OMA_{outer}), each lane	SRS	-	-	-1.8	dBm	2
Conditions of stressed receiver sensitivity test						
Stressed eye closure for PAM4	SECQ		4.4		dB	
OMA_{outer} of each aggressor lane	OMA_{outer}		3.5		dBm	

Notes
1.Receiver sensitivity (OMA_{outer}), each lane (max) is informative and is defined for a transmitter with TDECQ<=1.8 dB
2.Measured with conformance test signal at TP3 for the BER = 2.4x10-4

400G OSFP SR4 Transceiver
CC-OSFP04SR4-12D

Electrical Specification High Speed Signal

Parameter	Symbol	Min.	Typical	Max.	Unit	Notes
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%)		8.5	-	-	ps	
DC common mode Voltage		-350	-	2850	mV	

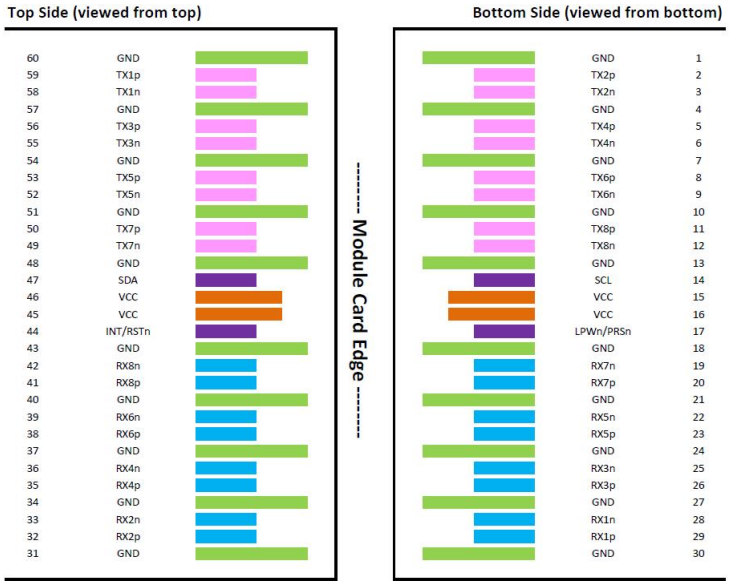
Transmitter (Module Input, TP1)

Parameter	Symbol	Min.	Typical	Max.	Unit	Notes
Differential pk-pk input Voltage tolerance		750	-	-	mV	
Differential termination mismatch		-	-	10	%	
Single-ended voltage tolerance range		-0.4	-	3.3	V	
DC common mode Voltage		-350	-	2850	mV	

Electrical Specification Low Speed Signal

Parameter	Symbol	Min.	Max.	Unit	Notes
Module output SCL and SDA	V_{OL}	0	0.4	V	
	V_{OH}	V_{CC}-0.5	V_{CC}+0.3	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	

Pin Definitions



400G OSFP SR4 Transceiver
CC-OSFP04SR4-12D

Pin Description

Pin#	Logic	Symbol	Description	Direction	Plug Sequence	Notes
1		GND	Ground		1	
2	CML-I	TX2p	Transmitter Data Non-Inverted	Input from Host	3	
3	CML-I	TX2n	Transmitter Data Inverted	Input from Host	3	
4		GND	Ground		1	
5	CML-I	TX4p	Transmitter Data Non-Inverted	Input from Host	3	
6	CML-I	TX4n	Transmitter Data Inverted	Input from Host	3	
7		GND	Ground		1	
8	CML-I	TX6p	Transmitter Data Non-Inverted	Input from Host	3	Not used
9	CML-I	TX6n	Transmitter Data Inverted	Input from Host	3	Not used
10		GND	Ground		1	
11	CML-I	TX8p	Transmitter Data Non-Inverted	Input from Host	3	Not used
12	CML-I	TX8n	Transmitter Data Inverted	Input from Host	3	Not used
13		GND	Ground		1	
14	LVCMOS-I/O	SCL	2-wire Serial interface clock	Bi-directional	3	
15		VCC	+3.3V Power	Power from Host	2	
16		VCC	+3.3V Power	Power from Host	2	
17	Multi-Level	LPWn/PRSn	Low-Power Mode / Module Present	Bi-directional	3	
18		GND	Ground		1	
19	CML-O	RX7n	Receiver Data Inverted	Output to Host	3	Not used
20	CML-O	RX7p	Receiver Data Non-Inverted	Output to Host	3	Not used
21		GND	Ground		1	
22	CML-O	RX5n	Receiver Data Inverted	Output to Host	3	Not used
23	CML-O	RX5p	Receiver Data Non-Inverted	Output to Host	3	Not used
24		GND	Ground		1	
25	CML-O	RX3n	Receiver Data Inverted	Output to Host	3	
26	CML-O	RX3p	Receiver Data Non-Inverted	Output to Host	3	
27		GND	Ground		1	
28	CML-O	RX1n	Receiver Data Inverted	Output to Host	3	
29	CML-O	RX1p	Receiver Data Non-Inverted	Output to Host	3	

30		GND	Ground		1	
31		GND	Ground		1	
32	CML-O	RX2p	Receiver Data Non-Inverted	Output to Host	3	
33	CML-O	RX2n	Receiver Data Inverted	Output to Host	3	
34		GND	Ground		1	
35	CML-O	RX4p	Receiver Data Non-Inverted	Output to Host	3	
36	CML-O	RX4n	Receiver Data Inverted	Output to Host	3	
37		GND	Ground		1	
38	CML-O	RX6p	Receiver Data Non-Inverted	Output to Host	3	Not used
39	CML-O	RX6n	Receiver Data Inverted	Output to Host	3	Not used
40		GND	Ground		1	
41	CML-O	RX8p	Receiver Data Non-Inverted	Output to Host	3	Not used
42	CML-O	RX8n	Receiver Data Inverted	Output to Host	3	Not used
43		GND	Ground		1	
44	Multi-Level	INT/RSTn	Module Interrupt / Module Reset	Bi-directional	3	
45		VCC	+3.3V Power	Power from Host	2	
46		VCC	+3.3V Power	Power from Host	2	
47	LVCMOS-I/O	SDA	2-wire Serial interface data	Bi-directional	3	
48		GND	Ground		1	
49	CML-I	TX7n	Transmitter Data Inverted	Input from Host	3	Not used
50	CML-I	TX7p	Transmitter Data Non-Inverted	Input from Host	3	Not used
51		GND	Ground		1	
52	CML-I	TX5n	Transmitter Data Inverted	Input from Host	3	Not used
53	CML-I	TX5p	Transmitter Data Non-Inverted	Input from Host	3	Not used
54		GND	Ground		1	
55	CML-I	TX3n	Transmitter Data Inverted	Input from Host	3	
56	CML-I	TX3p	Transmitter Data Non-Inverted	Input from Host	3	
57		GND	Ground		1	
58	CML-I	TX1n	Transmitter Data Inverted	Input from Host	3	
59	CML-I	TX1p	Transmitter Data Non-Inverted	Input from Host	3	
60		GND	Ground		1	

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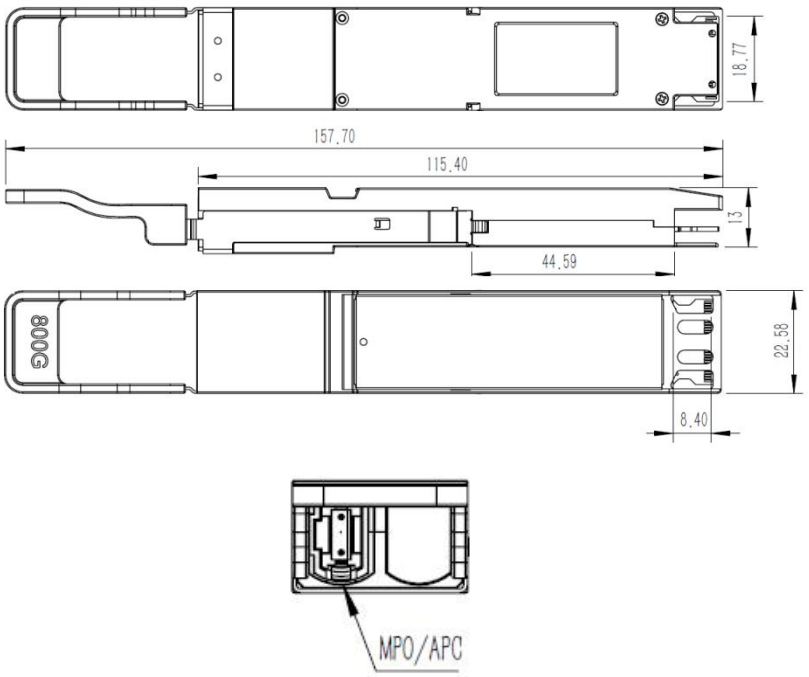
Outline Dimensions



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

Appendix A Document Revision

Version No.	Date	Description
V1.0	2024-02-01	First released
V1.1	2024-10-31	Update Operating Distance