

LO-CW400-LR4C

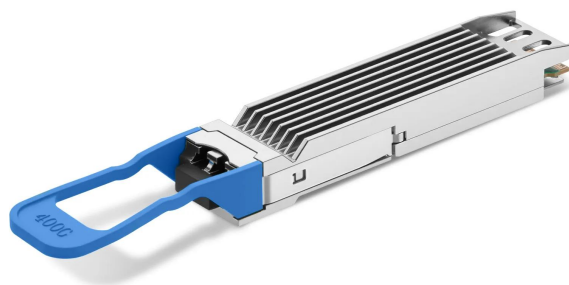
400G OSFP56 LR4 10KM Optical Transceiver

Features

- Compliant with IEEE 802.3cu and IEEE 802.3bs
- Compliant with OSFP 5.1 MSA
- Management Interface Based on CMIS 4.0
- Optical Interface: 106.25 Gbps (PAM4) x 4
- Electrical Interface: 53.125 Gbps (PAM4) x 8
- 4 CWDM EML and PIN Array Design
- Up to 10km over SMF with FEC
- Commercial Operating Temperature: 0°C to +70°C
- Single +3.3V Power Supply
- Max. Power Consumption: 10W
- Duplex LC Connector
- RoHS Compliant

Applications

- 400G Ethernet
- Data Centres



Description

The LO-CW400-LR4C is an eight-channel electrical, four-channel optical, pluggable, single-mode fiber, OSFP transceiver for 400G Ethernet applications. It converts eight host electrical data lanes in each direction at 53.125Gbps into four optical lanes at 106.25Gbps, and multiplexes them into one single-mode fiber for 425Gb/s optical transmission.

Each electrical lane operates at 26.5625 GBd / 53.125 Gbps (PAM4 encoded) and conforms to the IEEE 400GAUI-8 interface with host KP FEC. It allows communication up to 10km over a duplex LC connector single-mode optical fiber cable. These modules are designed to operate over single-mode fiber systems using CWDM nominal wavelengths of 1271nm, 1291nm, 1311nm, and 1331nm. The optical interface uses a conventional duplex LC SMF connector. This high-performance transceiver module is intended for medium-range SMF data communication and interconnect applications.

Absolute Maximum Ratings

It has to be noted that the operation in excess of any individual absolute maximum ratings might cause permanent damage to this module.

Parameter	Symbol	Min.	Typ.	Max.	Unit	Notes
Supply Voltage	VCC	-0.5		3.6	V	
Storage Temperature	TS	-40		85	°C	
Relative Humidity	RH	5		85	%	
Damage Threshold, Each Lane		6.6			dBm	

Recommended Operating Conditions and Power Supply Requirements

Electrical and optical characteristics below are defined under this operating environment, unless otherwise specified.

Parameter	Symbol	Min.	Typ.	Max.	Unit
Electrical Signal Rate, Each Lane		26.5625 ± 100ppm			GBd
Optical Signal Rate, Each Lane		53.125 ± 100ppm			GBd
Supply Voltage	VCC	3.135	3.3	3.465	V
Operating Case Temp.	TC	0		70	°C
Power Consumption	PC			10	W
Link Distance with G.652	DI	0.002		10	km

Electrical Characteristics

High Speed Electrical Input Characteristics

Parameter	Symbol	Min.	Typ.	Max.	Unit	Note
Data rate, each lane		26.5625 ± 100 ppm			GBd	
Differential Pk-pk Input Voltage Tolerance	TP1a	900			mV	1
Single-ended Voltage Tolerance	TP1a	-0.4		3.3	V	
DC Common Mode Voltage	TP1	-350		2850	mV	2

High Speed Electrical Output Characteristics

Parameter	Symbol	Min.	Typ.	Max.	Unit	Note
Data rate, each lane		26.5625 ± 100 ppm			GBd	
AC Common-mode Output Voltage (RMS)	TP4			17.5	mV	
Differential Peak-to-peak Output Voltage	TP4			900	mV	
Near-end ESMW (Eye Symmetry Mask Width)	TP4	0.265			UI	
Near-end Eye Height, Differential	TP4	70			mV	
Far-end ESMW (Eye Symmetry Mask Width)	TP4	0.2			UI	
Far-end Eye Height, Differential	TP4	30			mV	
DC Common Mode Voltage	TP4	-350		2850	mV	2

Note:

1. With the exception to IEEE802.3bs 120E.3.1.2 that the pattern is PRBS31Q or scrambled idle.
2. DC common mode voltage generated by the host. Specification includes effects of ground offset voltage.
3. Other electrical characteristics refer to the latest protocol requirements of 802.3bs Annex 120E

Optical Characteristics

Parameter	Symbol	Min.	Typ.	Max.	Unit	Notes
Transmitter						
Data rate, each Lane		53.125 ± 100 ppm			GBd	
Modulation format		PAM4				
Line wavelengths	λ_0	1264.5	1271	1277.5	nm	
	λ_1	1284.5	1291	1297.5	nm	
	λ_2	1304.5	1311	1317.5	nm	
	λ_3	1324.5	1331	1337.5	nm	
Total Average Launch Power	POUT			10.8	dBm	
Average Launch Power, Each Lane	P	-1.9		4.8	dBm	1
OMAouter Each Lane for TDECQ <1.4 dB for 1.4 dB ≤ TDECQ ≤ 3.4dB	POMA	1.1 -0.3+TDECQ		4.4 4.4	dBm	
Difference in Launch Power Between Any Two Lanes (OMAouter)				4	dB	
Transmitter and Dispersion Eye Closure for PAM4 (TDECQ), Each Lane				3.4	dB	
Transmitter Eye Closure for PAM4 (TECQ), Each Lane				3.4	dB	
TDECQ – TECQ				2.5	dB	
Over/Under-shoot				22	%	
Transmitter Power Excursion				2.8	dBm	
Side-mode Suppression		30			dB	

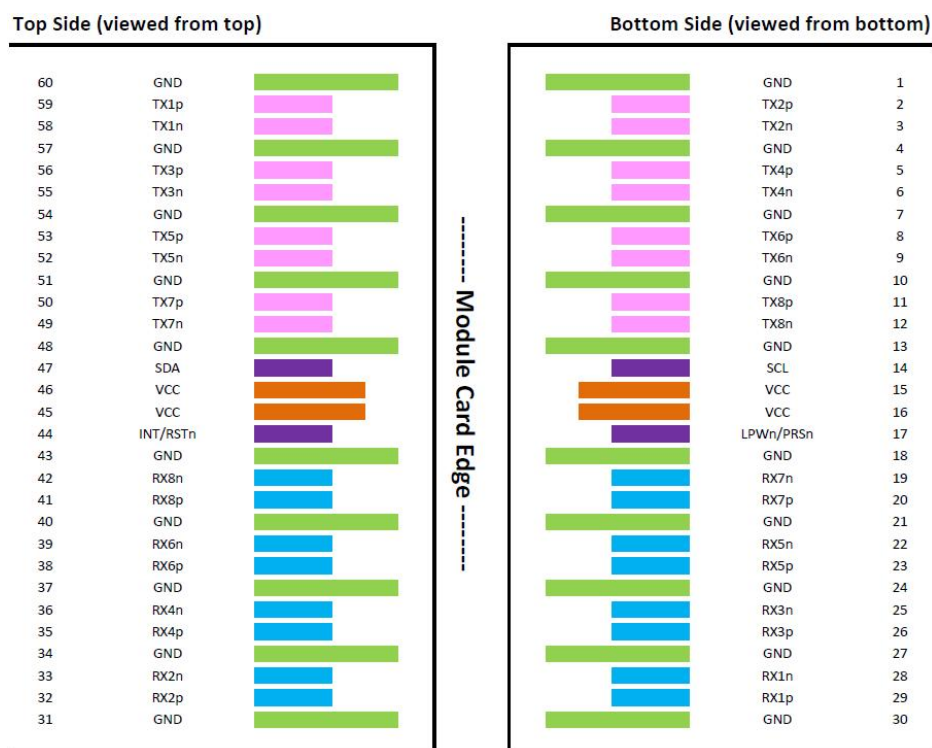
Ratio (SMSR)						
Extinction Ratio	ER	3.5			dB	
Transmitter Transition Time				17	ps	
Average Launch Power of the OFF Transmitter, Each Lane	Poff			-16	dBm	
RIN15.6OMA (max)	RIN			-136	dB/Hz	
Optical Return Loss Tolerance				15.6	dB	
Transmitter Reflectance				-26		2
Receiver						
Data rate, each Lane		53.125 ± 100 ppm			GBd	
Modulation format		PAM4				
Line wavelengths	λ_0	1264.5	1271	1277.5	nm	
	λ_1	1284.5	1291	1297.5	nm	
	λ_2	1304.5	1311	1317.5	nm	
	λ_3	1324.5	1331	1337.5	nm	
Damage Threshold, Each Lane		6.6			dBm	3
Average Receive Power, Each Lane		-9.1		5.6	dBm	4
Receive Power, Each Lane (OMAouter)	ROMA			4.4	dBm	
Difference in Receive Power Between Any Two Lanes, (OMAouter)				4.3	dB	
Receiver Reflectance				-26	dB	
Receiver Sensitivity (OMAouter)(max)	SEN	-6.8			dBm	

for TECQ < 1.4 dB for 1.4 dB ≤ TECQ ≤ 3.4 dB		TECQ-8.2				
Stressed Receiver Sensitivity (OMAouter), Each Lane	SEN			-4.1		5
Conditions of the Stressed Receiver Sensitivity Test						6
Stressed Eye Closure for PAM4 (SECQ), Lane Under Test		3.4			dB	
OMAouter of Each Aggressor Lane		-0.4			dBm	
LOS Assert		-30			dBm	
LOS De-Assert				-12	dBm	
LOS Hysteresis		0.5			dB	

Note:

1. Average launch power, each lane (min) is informative and not the principal indicator of signal strength. A transmitter with launch power below this value cannot be compliant; however, a value above this does not ensure compliance.
2. Transmitter reflectance is defined looking into the transmitter.
3. The receiver shall be able to tolerate, without damage, continuous exposure to an optical signal having this average power level.
4. Average receive power, each lane (min) is informative and not the principal indicator of signal strength. A received power below this value cannot be compliant; however, a value above this does not ensure compliance.
5. Measured with conformance test signal at TP3 (IEEE 802.3cu 151.8.13) for the BER specified in IEEE 802.3cu 151.1.1.
6. These test conditions are for measuring stressed receiver sensitivity. They are not characteristics of the receiver.

Pin Descriptions

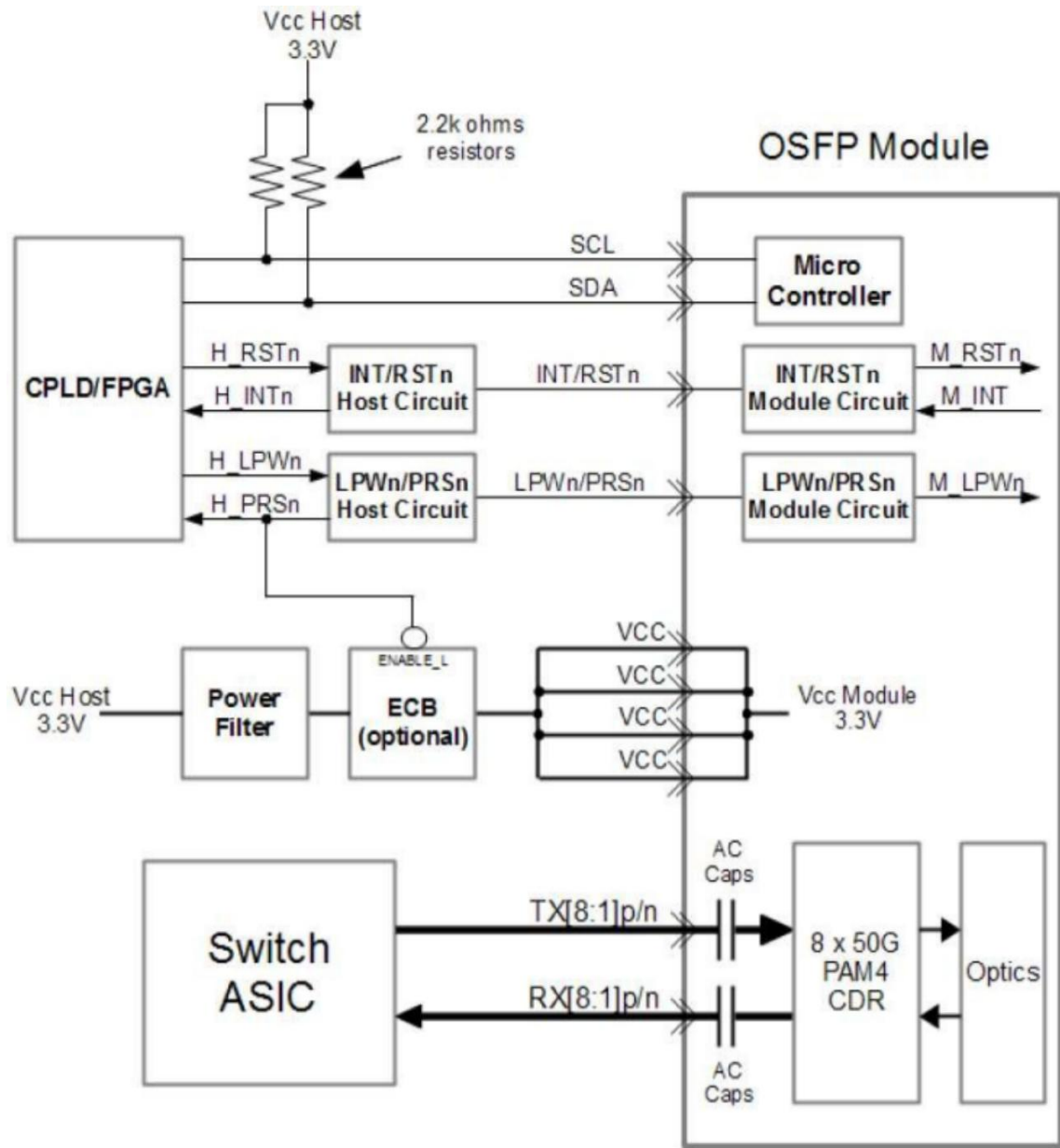


OSFP connector pin list

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

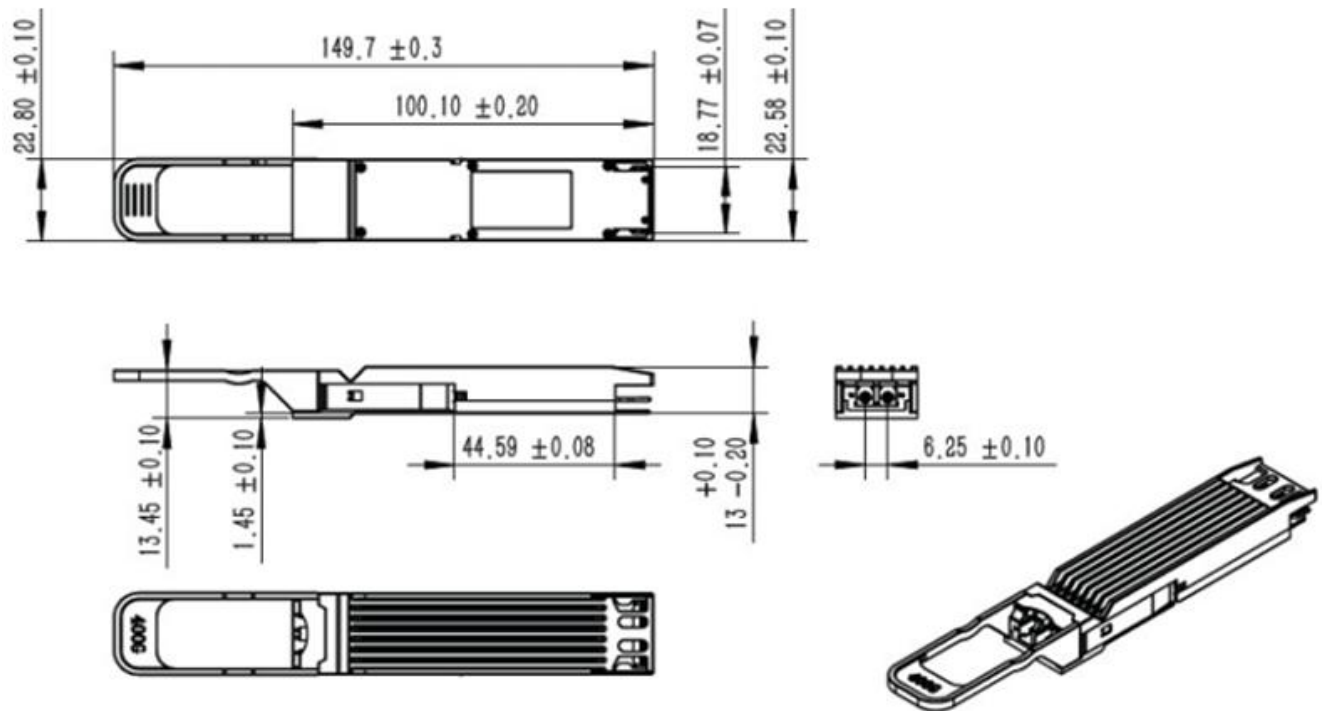
19	RX7n	CML-O	Receiver Data Inverted	
20	RX7p	CML-O	Receiver Data Non-Inverted	
21	GND		Ground	
22	RX5n	CML-O	Receiver Data Inverted	
23	RX5p	CML-O	Receiver Data Non-Inverted	
24	GND		Ground	
25	RX3n	CML-O	Receiver Data Inverted	
26	RX3p	CML-O	Receiver Data Non-Inverted	
27	GND		Ground	
28	RX1n	CML-O	Receiver Data Inverted	
29	RX1p		Receiver Data Non-Inverted	
30	GND		Ground	
31	GND		Ground	
32	RX2p	CML-O	Receiver Data Non-Inverted	
33	RX2n	CML-O	Receiver Data Inverted	
34	GND		Ground	
35	RX4p	CML-O	Receiver Data Non-Inverted	
36	RX4n	CML-O	Receiver Data Inverted	
37	GND		Ground	
38	RX6p	CML-O	Receiver Data Non-Inverted	
39	RX6n	CML-O	Receiver Data Inverted	
40	GND		Ground	
41	RX8p	CML-O	Receiver Data Non-Inverted	
42	RX8n	CML-O	Receiver Data Inverted	
43	GND		Ground	
44	INT/RSTn	Multi-Level	Module Interrupt / Module Reset	
45	VCC		+3.3V Power	
46	VCC		+3.3V Power	
47	SDA	LVC MOS-I/O	2-wire Serial interface data	
48	GND		Ground	
49	TX7n	CML-I	Transmitter Data Inverted	
50	TX7p	CML-I	Transmitter Data Non-Inverted	
51	GND		Ground	
52	TX5n	CML-I	Transmitter Data Inverted	
53	TX5p	CML-I	Transmitter Data Non-Inverted	
54	GND		Ground	
55	TX3n	CML-I	Transmitter Data Inverted	
56	TX3p	CML-I	Transmitter Data Non-Inverted	
57	GND		Ground	
58	TX1n	CML-I	Transmitter Data Inverted	
59	TX1p	CML-I	Transmitter Data Non-Inverted	
60	GND		Ground	

Principle Diagram



Mechanical Specifications

Unit: mm



Mechanical Dimensions

Ordering information

Part Number	Product Description
LO-CW400-LR4C	400G, OSFP56, LR4, dual LC, PAM4, 4 CWDM Lanes, SMF 10km, 0° C~+70° C