

OP-QSFP28-CWDM4

QSFP28 CWDM4 Optical Transceiver Module 2km LC DDM

Features

- Supports 103.1Gb/s, each lane bit rate 25.78 Gb/s
- Up to 2km transmission on single mode fiber (SMF) with FEC
- LAN WDM DFB laser and PIN receiver
- I2C interface with integrated Digital Diagnostic monitoring
- QSFP28 MSA package with duplex LC connector
- Single +3.3V power supply
- 4 CWDM lanes MUX/DEMUX design
- 100G CWDM4 MSA Technical Spec Rev1.1
- Maximum power consumption 3.5 W
- Operating case temperature: 0 to +70 °C
- Complies with EU Directive 2011/65/EU (RoHS 6/6)



Application

- Data Center Interconnect
- 100G Ethernet
- Infiniband QDR and DDR interconnects
- Enterprise networking

OP-QSFP28-CWDM4 QSFP28 transceiver module is designed for use in 100 Gigabit Ethernet links on up to 2km of single mode fiber. It is compliant with the 1000GBASE CWDM4 MSA standard. The module converts 4 inputs channels (ch) of 25Gb/s electrical data to 4 CWDM optical signals, and multiplexes them into a single channel for 100Gb/s optical transmission. Reversely, on the receiver side, the module optically de-multiplexes a 100Gb/s input into 4 CWDM channels signals, and converts them to 4 channel output electrical data.

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The central wavelengths of the 4 CWDM channels are 1271, 1291, 1311 and 1331 nm as members of the CWDM wavelength grid defined in ITU-T G.694.2. It contains a duplex LC connector for the optical interface and a 38-pin connector for the electrical interface. To minimize the optical dispersion in the long-haul system, single-mode fiber (SMF) has to be applied in this module. Host FEC is required to support up to 2km fiber transmission.

This product is designed with form factor, optical/electrical connection and digital diagnostic interface according to the QSFP28 Multi-Source Agreement (MSA). It has been designed to meet the harshest external operating conditions including temperature, humidity and EMI interference

Absolute Maximum Ratings

Parameter	Symbol	Min.	Typical	Max.	Unit	Notes
Storage Temperature	T_S	-40	-	+85	°C	
Supply Voltage	V_{CC}	-0.5	-	+4.0	V	
Operating Relative Humidity	RH	-	-	+85	%	

Recommended Operating Conditions

Parameter	Symbol	Min.	Typical	Max.	Unit	Notes
Operating Case Temperature	T_C	0	-	+70	°C	
Power Supply Voltage	V_{CC}	3.13	3.3	3.47	V	
Power Supply Current	I_{CC}	-	-	1.15	A	
Maximum Power Dissipation	P_D	-	-	4	W	
Aggregate Bit Rate	BR_{AVE}	-	103.125	-	Gb/s	
Lane Bit Rate	BR_{LANE}	-	25.78	-	Gb/s	
Transmission Distance	TD		-	2	km	Over SMF

Optical Characteristics

Parameter	Symbol	Min	Typical	Max	Unit	Notes
Transmitter						
Center Wavelength Lane 0	λ_0	1264.5	1271	1277.5	nm	
Center Wavelength Lane 1	λ_1	1284.5	1291	1297.5	nm	
Center Wavelength Lane 2	λ_2	1304.5	1311	1317.5	nm	
Center Wavelength Lane 3	λ_3	1324.5	1331	1337.5	nm	
Total Launch Power	P_{ALL}	-	-	8.5	dBm	1
Average Launch Power per Lane	P_{TX_LANE}	-6.5	-	2.5	dBm	1
Optical Modulation Amplitude (OMA), each Lane	POMA	-4		2.5	dBm	1
Launch Power in OMA minus Transmitter and Dispersion Penalty (TDP), each Lane		-5			dBm	

TDP, each Lane	TDP		-	3	dBm	
Extinction Ratio	ER	3.5	-	-	dB	
Relative Intensity Noise	RIN		-	-130	dB/H z	12dB reflection
Optical Return Loss Tolerance	TOL		-	20	dB	2
Transmitter Reflectance	RT		-	12	dB	
Average Launch Power OFF Transmitter, each Lane	Poff		-	-30	dBm	2
Transmitter Eye Mask Definition {X1, X2, X3, Y1, Y2, Y3}		{0.31, 0.4, 0.45, 0.34, 0.38, 0.4}				2
Receiver						
Damage Threshold, each Lane	THd	3.5			dBm	3
Total Average Receive Power				8.5	dBm	
Average Receive Power, each Lane		-11.5		2.5	dBm	
Receive Power (OMA), each Lane				2.5	dBm	
Receiver Sensitivity (OMA), each Lane	SEN			-10	dBm	forBER=5x10-5
Stressed Receiver Sensitivity (OMA), each Lane				-7.3	dBm	4
Receiver Reflectance	RR			-26	dB	
LOS Assert	LOSA	-30			dBm	
LOS Deassert	LOSD			-15	dBm	
LOS Hysteresis	LOSH	0.5			dB	
Receiver Electrical 3 dB upper Cutoff Frequency, each Lane				31	GHz	
Conditions of Stress Receiver Sensitivity Test (Note 5)						
Vertical Eye Closure Penalty, each Lane			1.9		dB	
Stressed Eye J2 Jitter, each Lane			0.33		UI	
Stressed Eye J4 Jitter, each Lane			0.48		UI	
SRS eye mask definition { X1, X2, X3, Y1, Y2, Y3}		{0.39, 0.5, 0.5, 0.39, 0.39, 0.4}				

Notes:

1. Even if the TDP < 1.0 dB, the OMA min must exceed the minimum value specified here.
2. Hit ratio 5x10-5.
3. The receiver shall be able to tolerate, without damage, continuous exposure to a modulated optical input signal having this power level on one lane. The receiver

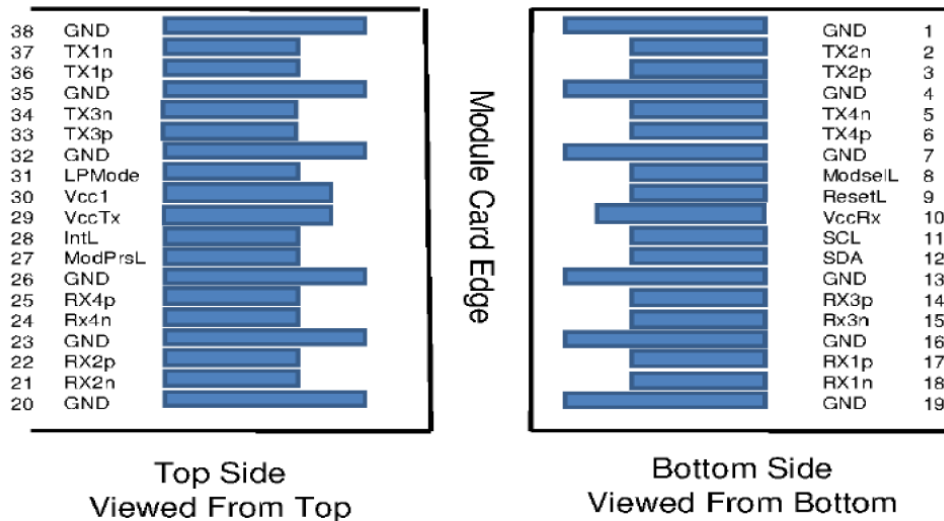
does not have to operate correctly at this input power.

4. Measured with conformance test signal for BER = 5×10^{-5} .
5. Vertical eye closure penalty, stressed eye J2 jitter, stressed eye J4 jitter, and SRS eye mask definition are test conditions for measuring stressed receiver sensitivity. They are not characteristics of the receiver

Electrical Characteristics

Parameter	Symbol	Min.	Typical	Max.	Unit	Notes
Transmitter (Module Input)						
Differential Data Input Amplitude	$V_{IN,P-P}$	100	-	1100	mVpp	
Input Impedance (Differential)	Z_{IN}	85	100	115	Ohms	
Differential Termination Mismatch		-	-	10	%	
Receiver (Module Output)						
Differential Data Output Amplitude	$V_{OUT,P-P}$	200	-	900	mVpp	
Output Impedance (Differential)	Z_{OUT}	85	100	115	Ohms	
Differential Termination Mismatch		-	-	10	%	
Output Rise/Fall Time, 20%~80%	T_R/T_F	12	-	-	ps	

Pin Description



Pin	Name	Logic	Function	Plug Seq.	Notes
1	GND		Ground	1	1
2	Tx2n	CML-I	Transmitter Inverted Data Input	3	
3	Tx2p	CML-I	Transmitter Non-Inverted Data	3	
4	GND		Ground	1	1
5	Tx4n	CML-I	Transmitter Inverted Data Input	3	
6	Tx4p	CML-I	Transmitter Non-Inverted Data	3	

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7	GND		Ground	1	1
8	ModSelL	LVTTL-I	Module Select	3	
9	ResetL	LVTTL-I	Module Reset	3	
10	VccRx		+3.3V Power Supply Receiver	2	2
11	SCL	LVC MOS-I/O	2-wire serial interface clock	3	
12	SDA	LVC MOS-I/O	2-wire serial interface data	3	
13	GND		Ground	1	
14	Rx3p	CML-O	Receiver Non-Inverted Data Output	3	
15	Rx3n	CML-O	Receiver Inverted Data Output	3	
16	GND		Ground	1	1
17	Rx1p	CML-O	Receiver Non-Inverted Data Output	3	
18	Rx1n	CML-O	Receiver Inverted Data Output	3	
19	GND		Ground	1	1
20	GND		Ground	1	1
21	Rx2n	CML-O	Receiver Inverted Data Output	3	
22	Rx2p	CML-O	Receiver Non-Inverted Data Output	3	
23	GND		Ground	1	1
24	Rx4n	CML-O	Receiver Inverted Data Output	3	
25	Rx4p	CML-O	Receiver Non-Inverted Data Output	3	
26	GND		Ground	1	1
27	ModPrsL	LVTTL-O	Module Present	3	
28	IntL	LVTTL-O	Interrupt	3	
29	VccTx		+3.3V Power supply transmitter	2	2
30	Vcc1		+3.3V Power supply	2	2
31	LPMODE	LVTTL-I	Low Power Mode	3	
32	GND		Ground	1	1
33	Tx3p	CML-I	Transmitter Non-Inverted Data	3	
34	Tx3n	CML-I	Transmitter Inverted Data Input	3	
35	GND		Ground	1	1
36	Tx1p	CML-I	Transmitter Non-Inverted Data	3	
37	Tx1n	CML-I	Transmitter Inverted Data Input	3	
38	GND		Ground	1	1

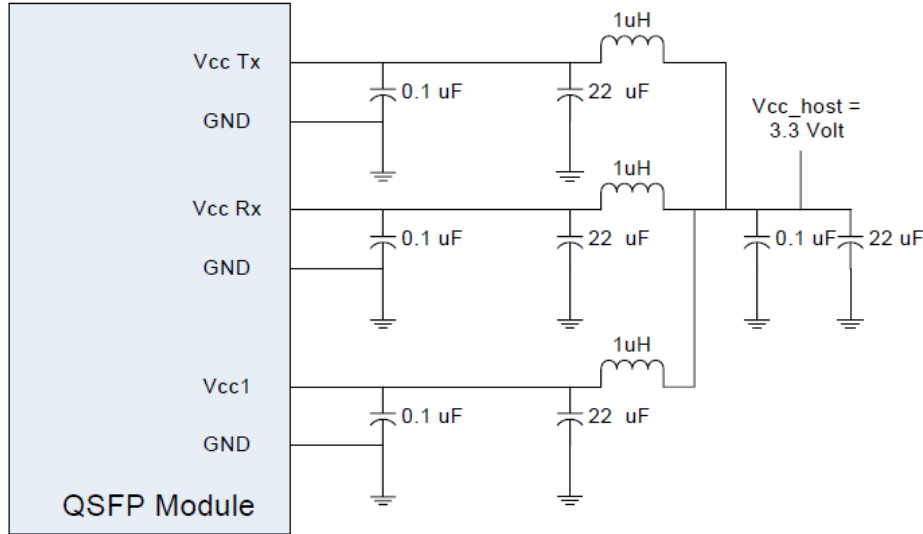
Notes:

1. GND is the symbol for signal and supply (power) common for QSFP28 modules. All are common within the QSFP28 module and all module voltages are referenced to this potential unless otherwise noted. Connect these directly to the host board signal

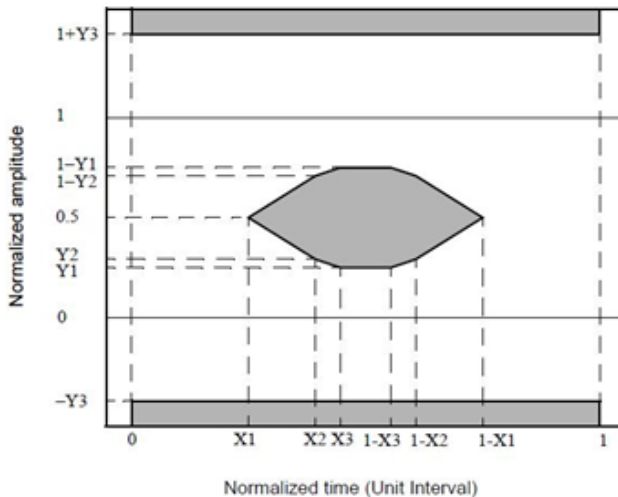
common ground plane.

2. VccRx, Vcc1 and VccTx are the receiving and transmission power suppliers and shall be applied concurrently. Recommended host board power supply filtering is shown in Figure 3 below. Vcc Rx, Vcc1 and Vcc Tx may be internally connected within the QSFP28 transceiver module in any combination. The connector pins are each rated for a maximum current of 1000mA.

Recommended Host Board Power Supply Circuit



Eye Mask Definition



X1 [±]	0.31 [±]	Y1 [±]	0.34 [±]
X2 [±]	0.40 [±]	Y2 [±]	0.38 [±]
X3 [±]	0.45 [±]	Y3 [±]	0.4 [±]

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 Per Lane	0 to 100	10%	mA	Internal
Tx Output Power Per Lane	to 2.9	±3	dBm	Internal



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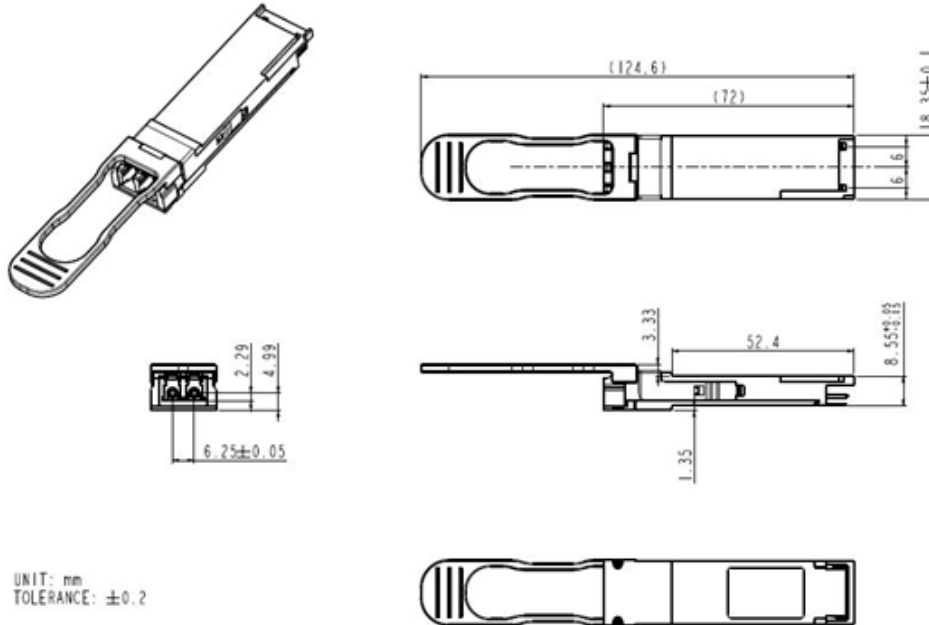
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Rx Power (Each Lane)	-21 to 5	±3	dBm	Internal
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Mechanical Dimension



Ordering Information

Part No.	Data Rate	Laser	Fiber Type	Distance	Optical Interface	Temp	DDMI
OP-QSFP28-CWDM4	103.1Gbps	CWDM DFB	SMF	2km	LC	0~70°C	Y