Product Features

- Hot-pluggable QSFP-DD MSA form factor
- Supports 212.5Gb/s aggregate bit rates
- Power dissipation < 10W
- Commercial case temperature range of 0°C to 70°C
- Single 3.3V power supply
- Maximum link length of 10km on Single Mode Fiber (SMF)
- Transmitter: Cooled 4 channels 200G PAM4 LAN WDM DML TOSA
- Receiver: 4 channels 200G PAM4 PIN ROSA
- 200GAUI-8 (or 200GAUI-4) Electrical Interface
- Duplex LC receptacles
- I2C Management Interface with DOM

Application

• IEEE 802.3bs 200GBASE-LR4 Ethernet (PAM4)

General Description

Hi-Optel's 200G QSFP-DD transceiver module is designed for use in 200G Ethernet interfaces over single mode fiber. It is compliant with both the QSFP-DD MSA and 200GBASE-LR4 specification. The central wavelengths of the 4 LAN WDM channels are 1295.56, 1300.05, 1304.58 and 1309.14 nm as members of the LAN WDM wavelength grid defined in IEEE 802.3ba. The high performance cooled LAN WDM DML TOSA transmitters and PIN-PD receivers provide superior performance for 200G Ethernet applications up to 10km links with FEC. Digital diagnostics functions are available via the I2C interface, as specified by QSFP-DD MSA. This product is intended to support data center applications.

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Ordering Information

Part Number	Description
HQSFPDD-2L2	QSFP-DD 200GBASE-LR4 LWDM 10 km

General Specifications:

Parameter	Symbol	Min	Typical	Max	Unit	Note
Data Rate, all Lanes combined	DR			212.50	Gb/s	
Data Rate, each Lane			26.5625		Gb/s	
Data Rate Accuracy		-100		100	ppm	
Link Distance	D			10	km	





Absolute Maximum Ratings:

Module performance is not guaranteed and reliability is not implied for any condition that beyond the

operating range. Exceeding the limits below may damage the transceiver module permanently.

Parameter	Symbol	Min	Max	Unit	Note
Storage Temperature	T _{ST}	-40	+85	°C	
Operating Case Temperature	T _{OP}	0	+70	°C	
Power Supply Voltage	Vcc	-0.5	+3.6	V	

Recommended Operating Conditions:

Parameter	Symbol	Min	Typical	Max	Unit	Note
Operating Case Temperature	T _{OP}	0		+70	Ĵ	
Power Supply Voltage	V _{cc}	3.135	3.3	3.465	V	

Electrical Characteristics:

Parameter	Symbol	Min	Typical	Max	Unit	Note
Power Supply Voltage	Vcc	3.135	3.3	3.465	V	
Power Supply Current	Icc			3	А	
Power Consumption	Р			10	W	
Transmitter Characteristics (Module Output)						
Differential Data Input Swing	+/-TX_ DAT	20		1200	mV_{pp}	
Common mode Voltage	V _{CM}	-350		2850	mV	1
Receiver Characteristics (Module Input)						
Differential Data Output Swing	+/-RX_ DAT	200		900	mV_{pp}	
Common Mode Voltage	Vсм	-350		2850	mV	1
Common Mode Noise, RMS	V _{NO}			17.5	mV	

Note: 1. V_{cm} is generated by the host. Specification includes effects of ground offset voltage.

Optical Characteristics:

Parameter	Symbol	Min	Typical	Max	Unit	Note
Long wavelength	Lo	1294.53	1295.56	1296.59	nm	
	L ₁	1299.02	1300.05	1301.09	nm	
	L ₂	1303.54	1304.58	1305.63	nm	
	L ₃	1308.09	1309.14	1310.19	nm	

200G QSFP-DD LR4 Optical Transceiver HQSFPDD-2L2 LAN WDM DFB, PIN, 0~70°C



Parameter	Symbol	Min	Typical	Max	Unit	Note
Transmitter Characteristics (Per Lane	e)					
Signaling Rate,each lane 26.5625 GBd PAM4			26.5625		GBd	PAM4 modulation
Side Mode Suppression Ratio	SMSR	30			dB	
Total Average Launch Power	Ρτ			11.3	dBm	
Average Launch Power per Lane	P _{AVG}	-3.4		5.3	dBm	
Extinction Ratio	ER	3.5			dB	
Outer Optical Modulation Amplitude(OMA outer),each lane	Рома	-0.4		5.1	dBm	
Difference in Launch power between any two lances(OMA outer)				4	dB	
Launch power in OMAouter minus TDECQ,each lane		-1.7			dBm	
Transmitter and dispersion eye closure for PAM4(TDECQ) each lane	TDECQ			3.2	dB	
Average Launch Power OFF Transmitter, each Lane	P_{off}			-30	dBm	
Relative Intensity Noise	RIN			-132	dB/HZ	
Optical return loss tolerance				15.6	dB	
Transmitter reflectance				-26	dB	
Receiver Characteristics (Per Lane)						
Signaling Rate,each lane			26.5625		GBd	PAM4 modulation
Signaling rate variation, each lane		-100		+100	ppm	
	Lo	1294.53	1295.56	1296.59	nm	
Long wavelength range	L1	1299.02	1300.05	1301.09	nm	
	L_2	1303.54	1304.58	1305.63	nm	
	L_3	1308.09	1309.14	1310.19	nm	
Damage threshold, each lane	R_{dam}	6.3			dBm	
Average receive power, each lane	Rpow	-9.7		5.3	dBm	
Receive power (OMAouter),each lane	Rома			5.1	dBm	
Difference in receive power between any two lanes(OMAouter)				4.2	dB	
Receiver refletance				-26	dB	
Receiver Sensitivity(OMAouter),each lane	SENeach			-7.7	dBm	
Stressed receiver sensitivity(OMAouter),each lane				-5.2	dBm	

200G QSFP-DD LR4 Optical Transceiver HQSFPDD-2L2 LAN WDM DFB, PIN, 0~70°C



Parameter	Symbol	Min	Typical	Max	Unit	Note
Condition	ns of stress	sed receive	er sensitivity	' test		
Stressed eye closure for PAM4(SECQ), lane under test				3.2	dB	
OMA _{outer} of each aggressor lane				-1	dBm	

Transceiver Block Diagram



Figure 2. Transceiver Block Diagram



Pin Definition and Description



Bottom side viewed from bottom



Figure 3. MSA compliant Connector(per QSFP-DD MSA)



Special Explanation on High-speed Electrical Interface

The electrical interface should comply with QSFP-DD MSA standard. The electrical interface will vary by application, but the nominal signaling lane rate is 26.5625Gbit/s per lane and comply with 200GAUI-8 (or 200GAUI-4) electrical interface specifications.

Table 7 The High-speed Signal Data Rate Supported by 200Gb/s QSFP-DD

Standard	Descirption	Nominal Bit Rate	Units
IEEE std-802.3bs	200G Ethernet	26.5625	Gbps

Mechanical Specifications

This product is compatible with the QSFP-DD Specification for pluggable form factor modules.



Figure 4. Mechanical Dimension (unit in mm)

ESD

This transceiver is specified as ESD threshold 500V electrostatic discharge for high speed pins and 2kV electrostatic discharge for all other electrical input pins, tested per JESD22-A114-B (Human Body Model). However, normal ESD precautions are still required during the handling of this module. This transceiver is shipped in ESD protective package. It should be removed from the package and handled only in an ESD protected environment.



Laser Safety

This is a Class 1 Laser Product according to EN 60825-1:2014. This product complies with 21 CFR 1040.10 and 1040.11 except for deviations pursuant to Laser Notice No. 50, dated (June 24, 2007). Caution: Use of controls or adjustments or performance of procedures other than those specified herein may result in hazardous radiation exposure.

Revision History

Revision	Date	Description
Preliminary	2021/1/20	Preliminary datasheet