

EQD200-LR4

200Gbps QSFP-DD LR4 Optical transceiver

PRODUCT FEATURES

- IEEE802.3bs compliant
- QSFP-DD MSA compliant
- 4 LWDM lanes MUX/DEMUX design
- Supports 212.5Gb/s aggregate bit rate
- Up to 10km transmission on single mode fiber (SMF) with FEC
- Operating case temperature: 0 to 70oC
- 200GAUI-8 electrical interface
- Maximum power consumption 10.8W
- LC duplex conn
- RoHS compliant

APPLICATIONS

- Data Center Interconnect
- 200G Ethernet
- Enterprise networking

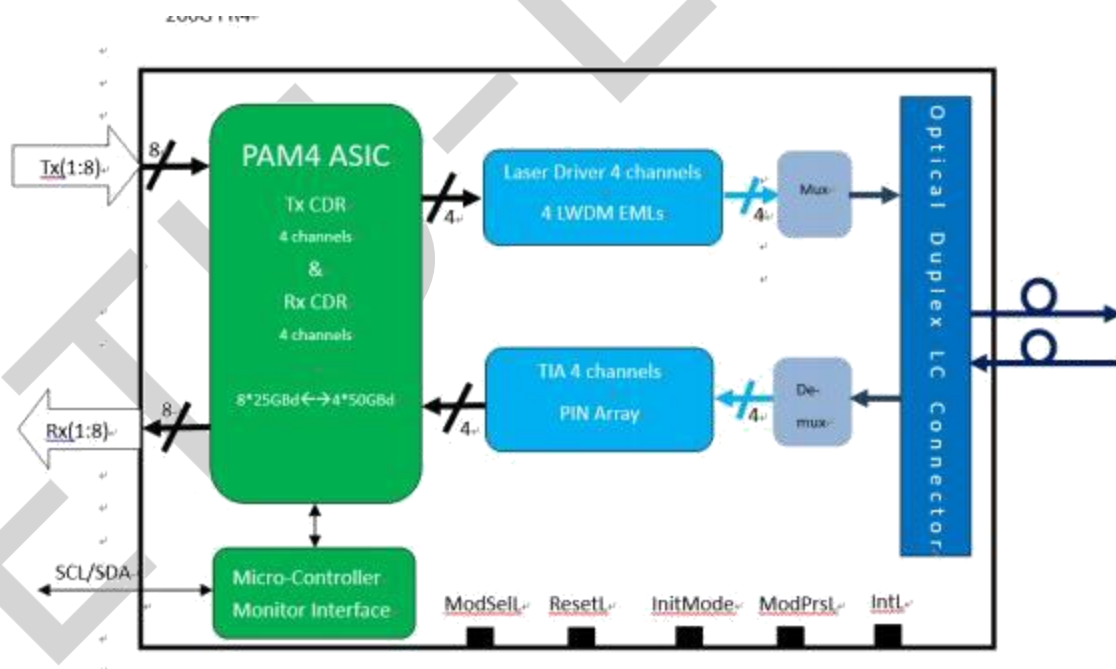
DESCRIPTIONS

This product is a 200Gb/s transceiver module designed for 10km optical communication applications. The design is compliant to IEEE802.3bs 200GBASE-LR4 standard. The module converts 8 input channels(ch) of 25Gb/s electrical data to 4 channels of LWDM optical signals, and multiplexes them into a single channel for 200Gb/s (PAM4) optical transmission. Reversely, on the receiver side, the module optically de-multiplexes a 200Gb/s(PAM4) input into 4 LWDM channels of signals, and converts them to 8 channels output electrical data .

The central wavelengths of the 4 LWDM channels. It contains a duplex LC connector for the optical interface and a 76-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 10km fiber transmission.

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

Module Block Diagram



Ordering Information

Part No.	Description
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EQD200-LR4	QSFP-DD LR4 10km with FEC optical transceiver with full real-time digital diagnostic monitoring and pull tab
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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	Max	Units	Notes
Storage Temperature	TS	-40	85	degC	
Operating Case Temperature	TOP	0	70	degC	
Power Supply Voltage	VCC	-0.5	3.6	V	
Relative Humidity (non-condensation)	RH	0	85	%	
Damage Threshold, each Lane	THd	6.3		dBm	

Recommended Operating Conditions

Parameter	Symbol	Min	Typical	Max	Units	Notes
Operating Case Temperature	TOP	0		70	degC	
Power Supply Voltage	VCC	3.135	3.3	3.465	V	
Data Rate, each Lane			26.5625		GBd	
			53.125		Gb/s	
Data Rate Accuracy		-100		100	ppm	
Pre-FEC Bit Error Ratio				2.4x10 ⁻⁴		
Post-FEC Bit Error Ratio				1x10 ⁻¹²		1
Control Input Voltage High		2		Vcc	V	
Control Input Voltage Low		0		0.8	V	
Link Distance with G.652	D	0.002		10	km	2

Notes:

1. FEC provided by host system.
2. FEC required on host system to support maximum distance.

Electrical Characteristics

The following electrical characteristics are defined over the Recommended Operating Environment unless otherwise specified.

Parameter	Test Point	Min	Typical	Max	Units	Notes
Power Consumption				10.8	W	
Supply Current	Icc				mA	
Transmitter (each Lane)						
Overload Differential Voltage pk-pk	TP1a			900	mV	
Common Mode Voltage (Vcm)	TP1	-300		2800	mV	
Receiver (each Lane)						
Differential Voltage, pk-pk	TP4			900	mV	

Optical and Characteristics

Parameter	Symbol	Min	Typical	Max	Units	Notes
Wavelength Assignment	L0	1294.53		1296.59	nm	
	L1	1299.02		1301.09	nm	
	L2	1303.54		1305.63	nm	
	L3	1308.09		1310.19	nm	
Transmitter						
Data Rate, each Lane		26.5625 ± 100 ppm			GBd	
Modulation Format		PAM4				
Side-mode Suppression Ratio	SMSR	30			dB	Modulated
Total Average Launch Power	PT	2.6		11.3	dBm	
Average Launch Power, each Lane	PAVG	-3.4		5.3	dBm	1
Outer Optical Modulation Amplitude (OMA _{outer}), each Lane	POMA	-0.4		5.1	dBm	2
Launch Power in OMA _{outer} minus TDECQ, each Lane		-1.8			dB	For ER ≥ 4.5dB
		-1.7			dB	For ER < 4.5dB
Transmitter and Dispersion Eye Clouser for PAM4, each Lane	TDECQ			3.2	dB	

Extinction Ratio	ER	3.5			dB	
Difference in Launch Power between any Two Lanes (OMA _{outer})				4	dB	
RIN _{16.5OMA}	RIN			-132	dB/Hz	
Optical Return Loss Tolerance	TOL			15.6	dB	
Transmitter Reflectance	TR			-26	dB	
Average Launch Power of OFF Transmitter, each Lane	P _{off}			-30	dBm	
Receiver						
Data Rate, each Lane		26.5625 ± 100 ppm			GBd	
Modulation Format		PAM4				
Damage Threshold, each Lane	TH _d	6.3			dBm	3
Average Receive Power, each Lane		-9.7		5.3	dBm	4
Receive Power (OMA _{outer}), each Lane				5.1	dBm	
Difference in Receiver Power between any Two Lanes (OMA _{outer})				4.2	dB	
Receiver Sensitivity (OMA _{outer}), each Lane	SEN			max (-7.2 ,SECQ -8.6)	dBm	For BER of 2.4E-4
Stressed Receiver Sensitivity (OMA _{outer}), each Lane	SRS			-5.4	dBm	5
Receiver Reflectance	RR			-26	dB	
LOS Assert	LOSA	-25.7			dBm	
LOS De-assert	LOSD			-11.7	dBm	
LOS Hysteresis	LOSH	0.5			dB	

Notes:

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.

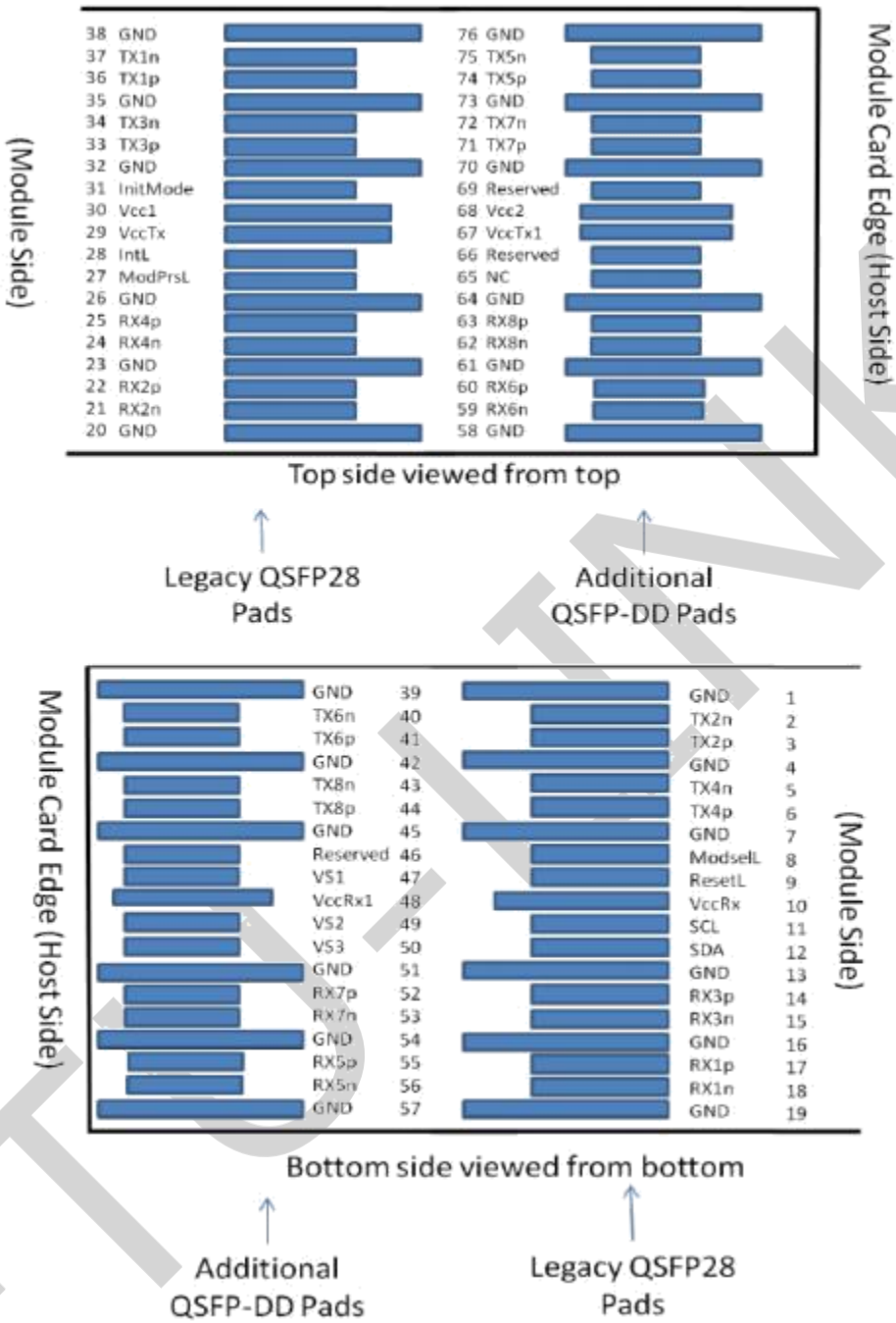
2. Even if the TDECQ < 1.4 dB for an extinction ratio of ≥ 4.5 dB or TDECQ < 1.3 dB for an extinction ratio of < 4.5 dB, the OMA_{outer} (min) must exceed the minimum value specified here.
3. The receiver shall be able to tolerate, without damage, continuous exposure to an optical input signal having 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 for BER = 2.4×10^{-4} .
6. These test conditions are for measuring stressed receiver sensitivity. They are not characteristics of the receiver.

Digital Diagnostics

The following digital diagnostic characteristics are defined over the normal operating conditions unless otherwise specified.

Parameter	Symbol	Min	Max	Units	Notes
Temperature monitor absolute error	DMI_Temp	-3	3	degC	Over operating temperature range
Supply voltage monitor absolute error	DMI_VCC	-0.1	0.1	V	Over full operating range
Channel RX power monitor absolute error	DMI_RX_Ch	-3	3	dB	
Channel Bias current monitor	DMI_Ibias_Ch	-10%	10%	mA	
Channel TX power monitor absolute error	DMI_TX_Ch	-3	3	dB	

Pin Diagram



Pin Definitions

Pin #	Logic	Symbol	Description	Plug Sequence	Notes
1		GND	Ground	1B	1
2	CML-I	Tx2n	Transmitter Inverted Data Input	3B	
3	CML-I	Tx2p	Transmitter Non-Inverted Data Input	3B	

4		GND	Ground	1B	1
5	CML-I	Tx4n	Transmitter Inverted Data Input	3B	
6	CML-I	Tx4p	Transmitter Non-Inverted Data Input	3B	
7		GND	Ground	1B	1
8	LVTTL-I	ModSelL	Module Select	3B	
9	LVTTL-I	ResetL	Module Reset	3B	
10		VccRx	+3.3V Power Supply Receiver	2B	2
11	LVC MOS-I/O	SCL	2-wire serial interface clock	3B	
12	LVC MOS-I/O	SDA	2-wire serial interface data	3B	
13		GND	Ground	1B	1
14	CML-O	Rx3p	Receiver Non-Inverted Data Output	3B	
15	CML-O	Rx3n	Receiver Inverted Data Output	3B	
16	GND	Ground	1B		1
17	CML-O	Rx1p	Receiver Non-Inverted Data Output	3B	
18	CML-O	Rx1n	Receiver Inverted Data Output	3B	
19		GND	Ground	1B	1
20		GND	Ground	1B	1
21	CML-O	Rx2n	Receiver Inverted Data Output	3B	
22	CML-O	Rx2p	Receiver Non-Inverted Data Output	3B	
23		GND	Ground	1B	1
24	CML-O	Rx4n	Receiver Inverted Data Output	3B	
25	CML-O	Rx4p	Receiver Non-Inverted Data Output	3B	
26		GND	Ground	1B	1
27	LVTTL-O	ModPrsL	Module Present	3B	
28	LVTTL-O	IntL	Interrupt	3B	
29		VccTx	+3.3V Power supply transmitter	2B	2
30		Vcc1	+3.3V Power supply	2B	2
31	LVTTL-I	InitMode	Initialization mode; In legacy QSFP applications, the InitMode pad is called LPMODE	3B	
32		GND	Ground	1B	1
33	CML-I	Tx3p	Transmitter Non-Inverted Data Input	3B	
34	CML-I	Tx3n	Transmitter Inverted Data Input	3B	
35		GND	Ground	1B	1
36	CML-I	Tx1p	Transmitter Non-Inverted Data Input	3B	
37	CML-I	Tx1n	Transmitter Inverted Data Input	3B	

38		GND	Ground	1B	1
39		GND	Ground	1A	1
40	CML-I	Tx6n	Transmitter Inverted Data Input	3A	
41	CML-I	Tx6p	Transmitter Non-Inverted Data Input	3A	
42		GND	Ground	1A	1
43	CML-I	Tx8n	Transmitter Inverted Data Input	3A	
44	CML-I	Tx8p	Transmitter Non-Inverted Data Input	3A	
45		GND	Ground	1A	1
46		Reserved	For future use	3A	3
47		VS1	Module Vendor Specific 1	3A	3
48		VccRx1	3.3V Power Supply	2A	2
49		VS2	Module Vendor Specific 2	3A	3
50		VS3	Module Vendor Specific 3	3A	3
51		GND	Ground	1A	1
52	CML-O	Rx7p	Receiver Non-Inverted Data Output	3A	
53	CML-O	Rx7n	Receiver Inverted Data Output	3A	
54		GND	Ground	1A	1
55	CML-O	Rx5p	Receiver Non-Inverted Data Output	3A	
56	CML-O	Rx5n	Receiver Inverted Data Output	3A	
57		GND	Ground	1A	1
58		GND	Ground	1A	1
59	CML-O	Rx6n	Receiver Inverted Data Output	3A	
60	CML-O	Rx6p	Receiver Non-Inverted Data Output	3A	
61		GND	Ground	1A	1
62	CML-O	Rx8n	Receiver Inverted Data Output	3A	
63	CML-O	Rx8p	Receiver Non-Inverted Data Output	3A	
64		GND	Ground	1A	1
65		NC	No Connect	3A	3
66		Reserved	For future use	3A	3
67		VccTx1	3.3V Power Supply	2A	2
68		Vcc2	3.3V Power Supply	2A	2
69		Reserved	For Future Use	3A	3
70		GND	Ground	1A	1
71	CML-I	Tx7p	Transmitter Non-Inverted Data Input	3A	
72	CML-I	Tx7n	Transmitter Inverted Data Input	3A	
73		GND	Ground	1A	1
74	CML-I	Tx5p	Transmitter Non-Inverted Data Input	3A	

75	CML-I	Tx5n	Transmitter Inverted Data Input	3A	
76		GND	Ground	1A	1

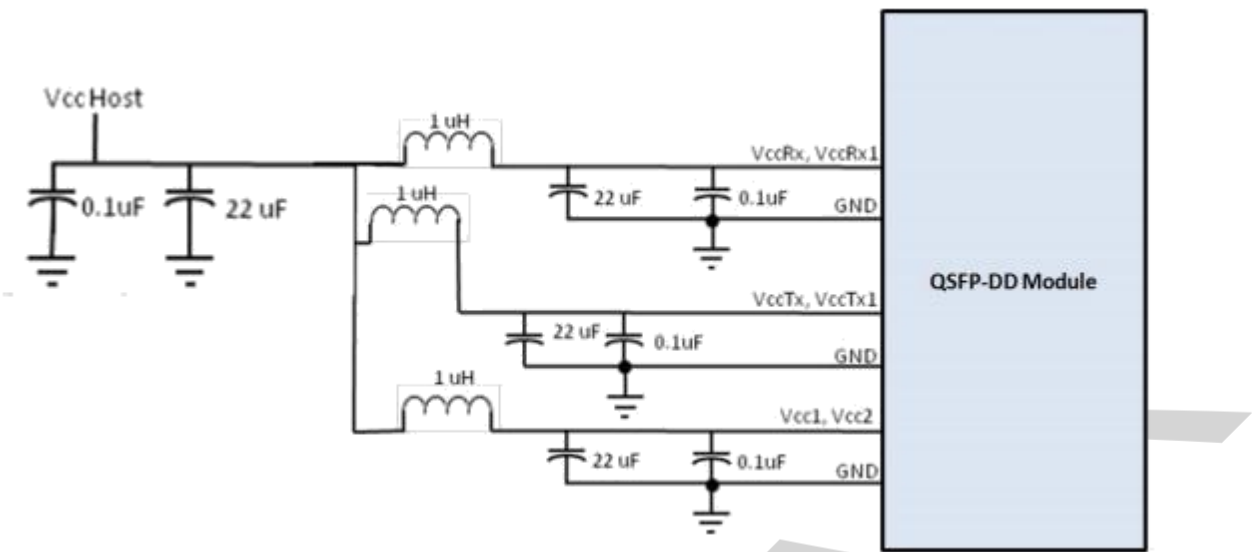
Notes:

1. GND is the symbol for signal and supply (power) common for QSFP-DD modules. All are common within the QSFP-DD 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 QSFP-DD transceiver module in any combination. The connector pins are each rated for a maximum current of 1000mA.

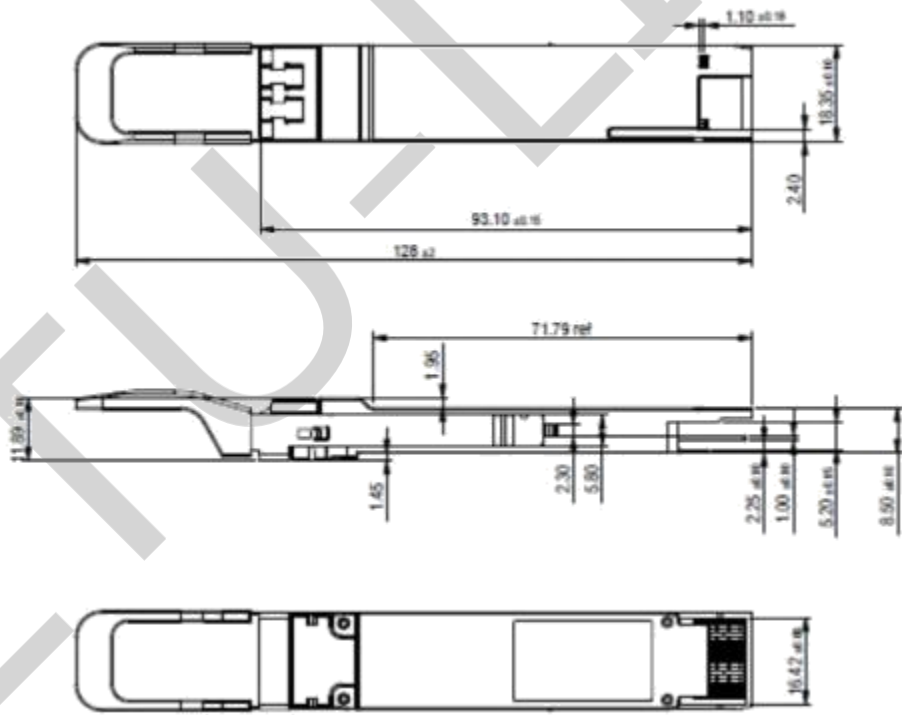
Alarm & warning threshold

Parameters	Unit	Value
Low temperature warning	°C	0
High temperature warning	°C	70
Low voltage warning	V	3.135
High voltage warning	V	3.465
Low Tx power warning	dBm	-3.4
High Tx power warning	dBm	5.3
Low Rx power warning	dBm	-10.2
High Rx power warning	dBm	5.3
Low temperature alarm	°C	-10
High temperature alarm	°C	80
Low voltage alarm	V	2.97
High voltage alarm	V	3.63
Low Tx power alarm	dBm	-6.4
High Tx power alarm	dBm	8.2
Low Rx power alarm	dBm	-13.2
High Rx power alarm	dBm	8.2

Recommended Interface Circuit



Mechanical Diagram



Revision History

Version No.	Date	Description
1.0	Aug 25, 2021	Preliminary datasheet
2.0	Sep 20,2024	Format change

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