

	Datasheet	No.	DS10-QR005
		Initial Date	2024-08-28
OQR	OQRC3D1	Written Team	R&D Dept.
			GH Zheng

I Preview

PN	OQRC3D1
Description	800G QSFP-DD 2xLR4 1310nm-CWDM 10KM dual duplex LC DDMI 0~70 °C

II Contents

- Features
- Applications
- Description
- Absolute maximum Ratings
- Operating Environment
- Optical Characteristics
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III Revision History

No.	Date	Items	Change Recording	Ver.	Rev.	Customer
1	2024-02-28	All	Initial registration	000	000	Standard
2						
3						
4						
5						
6						

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1. Features

- ◆ Compliant with QSFP-DD800 MSA HW Rev 6.01 with dual duplex LC connector
- ◆ Compliant with IEEE 802.3-2022:
 - 2x400GBASE-LR4-6 optical interface
 - 2x400G-LR4-10 optical interface
- ◆ Compliant with IEEE 802.3df-2024
 - 2x400GAUI-4 C2M electrical interface
- ◆ Compliant with CMIS Rev 5.0
- ◆ Two wire serial Interface with digital diagnostic monitoring
- ◆ RoHS compliant
- ◆ Operating case temperature: Standard: 0 to +70°C

2. Applications

- ◆ 2x400G Ethernet
- ◆ Other links

3. Description

The OCRECOM's OQRC3D1 is a module is designed for use in 800 Gigabit Ethernet links over 10km single mode fiber. The module has 8 independent electrical input/output channels operating up to 106.25Gbps per channel. This transceiver consists of two transmitter/receiver units, with each operating on a set of 4 wavelengths on the ITU G.694.2 CWDM grid near 1300nm.

4. 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	Unit	Note
Storage Temperature	TST	-40	85	°C	
Relative Humidity(non-condensing)	RH	5	85	%	
Operating Case Temperature	TOPC	0	70	°C	
Supply Voltage	VCC	-0.5	3.6	V	
Data Input Voltage Differential	$ V_{IN}-V_{IN} $	-	1	V	
Control Input Voltage	V_I	-0.3	$V_{CC}+0.5$	V	
Control Output Current	I_O	-20	20	mA	

5. Operating Environment

Parameter	Symbol	Min	Typical	Max	Unit	Note
Operating Case Temperature	TOPC	0		70	°C	

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Power Supply Voltage	VCC	3.13	3.3	3.47	V	
Instantaneous peak current at hot plug	I _{CP}	-	-	7200	mA	
Sustained peak current at hot plug	I _{CP}	-	-	5941	mA	
Power dissipation		-		18	W	
Power dissipation, Low Power Mode		-		2	W	
Signalling Speed per Lane	DRL		53.125		Gbd	
Control Input Voltage High	V _H	V _{CC} *0.7	-	V _{CC} +0.3	V	
Control Input Voltage Low	V _L	-0.3	-	V _{CC} *0.3	V	
Two Wire Serial Interface Clock Rate	-	-	-	400	kHz	
Power Supply Noise 1 kHz - 1 MHz (p-p)	-	-	-	66	mVpp	
Operating Distance	-	2	-	6000	m	Follow IEEE
	-	2	-	10000	m	Follow MSA

6. Optical Characteristics

The following tables list the performance specifications for the various functional blocks of the integrated optical transceiver module..

Transmitter						
Parameter	Symbol	Min	Typical	Max	Unit	Notes
Wavelength L0, L4	$\lambda_{C0}, \lambda_{C4}$	1264.5	1271	1277.5	nm	
Wavelength L1, L5	$\lambda_{C1}, \lambda_{C5}$	1284.5	1291	1297.5	nm	
Wavelength L2, L6	$\lambda_{C2}, \lambda_{C6}$	1304.5	1311	1317.5	nm	
Wavelength L3, L7	$\lambda_{C3}, \lambda_{C7}$	1324.5	1331	1337.5	nm	
Data Rate, each Lane		53.125 ± 100 ppm			GBd	
Modulation Format		PAM4				
Side Mode Suppression Ratio	SMSR	30			dB	
Total Average Launch Power	P _T			11.1	dBm	
Average Launch Power, each lane	P _{AVG}	-2.7	-	+5.1	dBm	1
Outer Optical Modulation Amplitude (OMA _{outer}), each Lane for TDECQ <1.4 dB for 1.4 dB ≤ TDECQ ≤ 3.4 dB	T _{OMA}	0.3 -1.1 + TDECQ	-	4.4	dBm	
Difference in launch power between any two lanes (OMA _{outer})	AOP _d	-	-	4	dB	

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Transmitter and Dispersion Eye Closure for PAM4 (TDECQ), each lane 10KM	TDECQ	-	-	3.9	dB	
Transmitter and Dispersion Eye Closure for PAM4 (TDECQ), each lane 6KM	TDECQ	-	-	3.4	dB	
Transmitter eye closure for PAM4 (TECQ), each lane 10KM	TECQ	-	-	3.9	dB	
Transmitter eye closure for PAM4 (TECQ), each lane 6KM	TECQ	-	-	3.4	dB	
TDECQ – TECQ	-	-	-	2.5	dB	
Transmitter Over/under-shoot 10KM				25	%	
Transmitter Over/under-shoot 6KM	-	-	-	22	%	
Transmitter peak-to-peak power_10km				52	dBm	
Transmitter power excursion 6KM	-	-	-	25	dBm	
Average Launch Power of OFF Transmitter, each lane	T _{OFF}	-	-	-16	dBm	
Extinction Ratio	ER	3.5	-	-	dB	
Transmitter transition time(max)	T _r	-	-	17	ps	
RIN _{OMA} (max)	RIN	-	-	-136	dB/Hz	
Optical Return Loss Tolerance	ORL	-	-	15.6	dB	
Transmitter Reflectance	T _R			-26	dB	2

Receiver						
Data Rate, each Lane		53.125 ± 100 ppm			GBd	
Wavelength L0, L4	$\lambda_{C0}, \lambda_{C4}$	1264.5	1271	1277.5	nm	
Wavelength L1, L5	$\lambda_{C1}, \lambda_{C5}$	1284.5	1291	1297.5	nm	
Wavelength L2, L6	$\lambda_{C2}, \lambda_{C6}$	1304.5	1311	1317.5	nm	
Wavelength L3, L7	$\lambda_{C3}, \lambda_{C7}$	1324.5	1331	1337.5	nm	
Damage Threshold	THd	6.1			dBm	
Average Receive Power, each Lane	AOP _R	-9		5.1	dBm	
Receive Power (OMA), each Lane	OMA _R			4.4	dBm	
Receiver sensitivity (OMA _{outer}), each lane for TECQ < 1.4 dB for 1.4 dB ≤ TECQ ≤ 3.4 dB	SOMA			-6.8–8.2 + TECQ	dBm	

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Stressed Receiver Sensitivity (OMA), each Lane 10KM	SRS			-4.3	dBm	3
Stressed Receiver Sensitivity (OMA), each Lane 6KM	SRS			-4.8	dBm	3
Receiver Reflectance	R _R			-26	dB	
Difference in Receive Power between any Two Lanes (OMA)	AOP _g			4.3	dB	
Conditions of Stress Receiver Sensitivity Test						
Stressed eye closure for PAM4 (SECQ), lane under test 10KM	-	-	3.9	-	dB	
Stressed eye closure for PAM4 (SECQ), lane under test 6KM	-	-	3.4	-	dB	
OMA _{outer} of each aggressor lane	-	-	-0.4	-	dBm	

Notes:

- 1, Average launch power, each lane (min) is informative and not the principal indicator of signal strength
- 2, Transmitter reflectance is defined looking into the transmitter
- 3, Measured with conformance test signal at TP3 for the BER = 2.4×10^{-4}

7. Electrical Specifications

Transmitter (Module Input, TP1)						
Parameter	Symbol	Min	Typical	Max	Units	Notes
Differential pk-pk input Voltage tolerance (TP1a)	-	750	-	-	mV	
Peak-to-peak AC common-mode voltage tolerance Low-frequency, VCMLF Full-band, VCMFB	-	32 80	-	-	mV	
Differential-mode to common-mode return loss	RL _{cd}	802.3ck 120G-2			dB	
Effective return loss	ERL	8.5	-	-	dB	
Differential termination mismatch	-	-	-	10	%	
Single-ended voltage tolerance range	-	-0.4	-	3.3	V	
DC common-mode voltage tolerance	-	-0.35	-	2.85	V	
Receiver (Module Output, TP4)						
Peak-to-peak AC common-mode voltage Low-frequency, VCMLF Full- band, VCMFB	-	-	-	32 80	mV	

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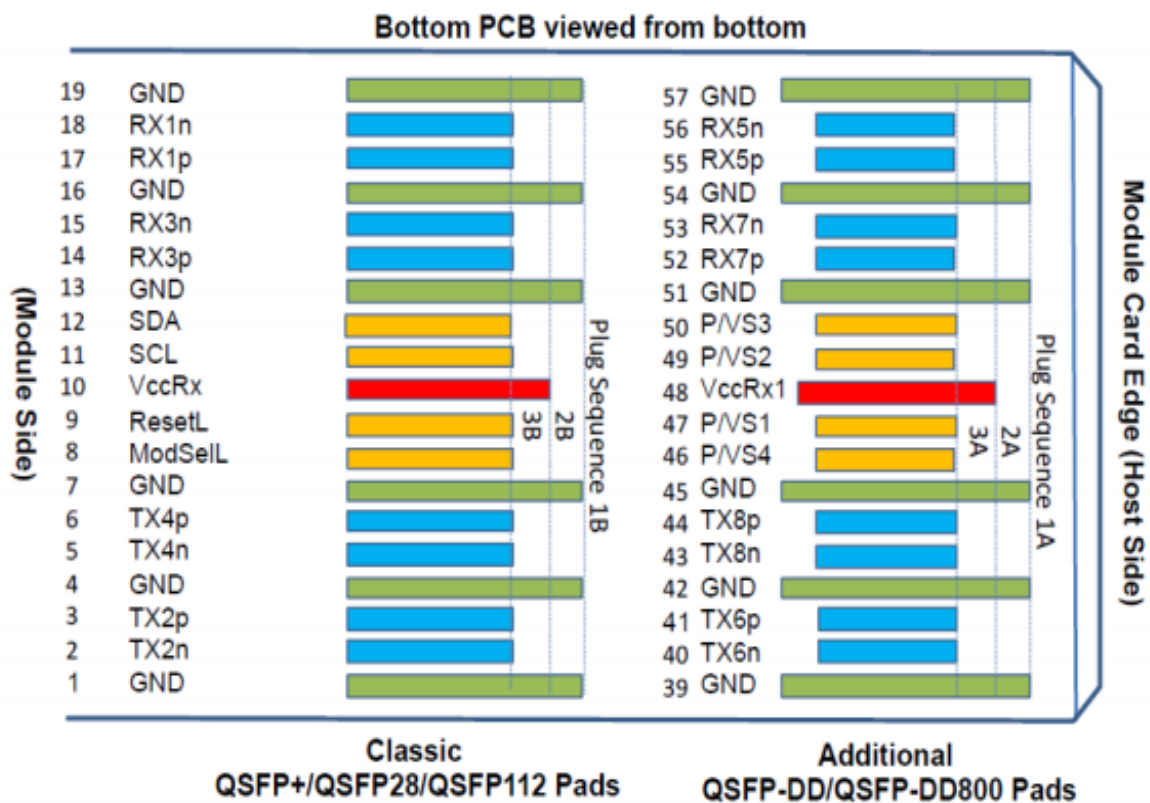
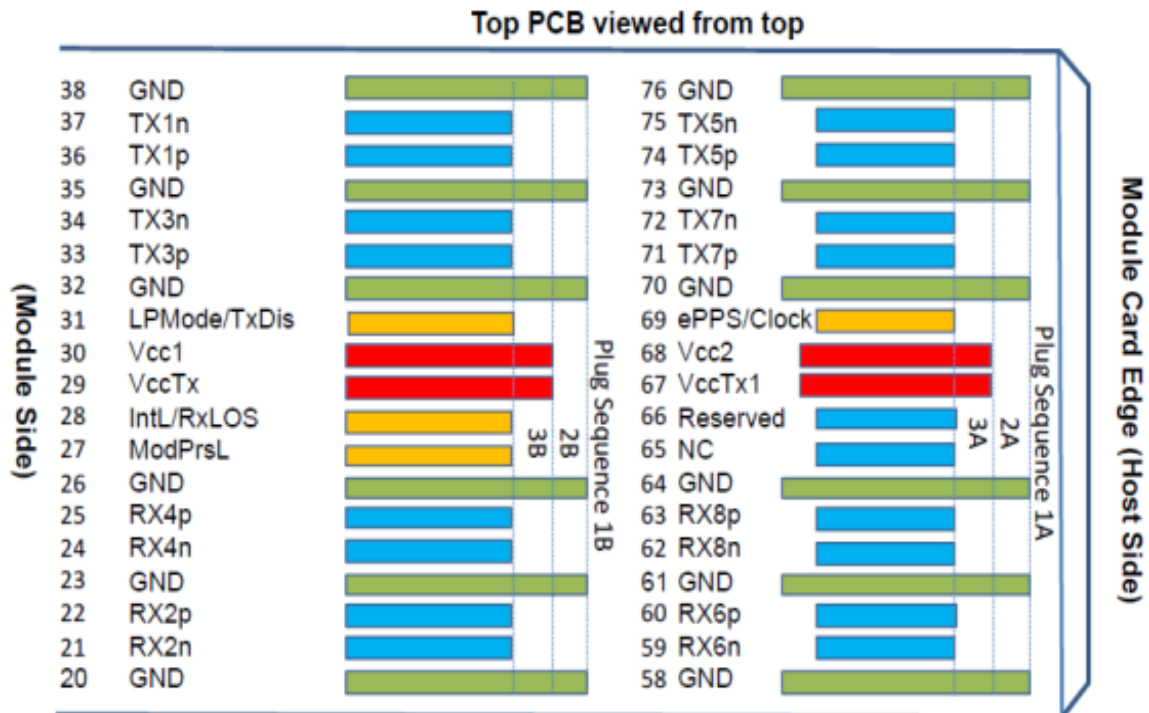
Differential peak-to-peak output voltage Short mode Long mode Disabled	-	-	-	600 845 35	mV	
Eye height	EH	15	-	-	mV	
Vertical eye closure	VEC	-	-	12	dB	
Common-mode to differential-mode return loss	RLDc	802.3ck120G-1			dB	
Effective return loss	ERL	8.5			dB	
Differential termination mismatch	-	-	-	10	%	
Transition time		8.5			ps	
DC common-mode voltage tolerance	-	-0.35		2.85	V	
Electrical Specification Low Speed Control and Sense Signals						
Module output SCL and SDA	V _{OL}	0		0.4	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	
LPMode/TxDis, ResetL and ModSelL	V _{IL}	-0.3		0.8	V	
	V _{IH}	2		V _{CC} +0.3	V	
IntL/RxLOS	V _{OL}	0		0.4	V	
	V _{OH}	V _{CC} -0.5		V _{CC} +0.3	V	

8. Pin Descriptions

The electrical pinout of the QSFP-DD module is shown in below.

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MSA Compliant Connector

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PIN	Logic	Symbol	Description
1		GND	Ground
2	CML-I	Tx2n	Transmitter Inverted Data Input
3	CML-I	Tx2p	Transmitter Non-Inverted Data Input
4		GND	Ground
5	CML-I	Tx4n	Transmitter Inverted Data Input
6	CML-I	Tx4p	Transmitter Non-Inverted Data Input
7		GND	Ground
8	LVTTL-I	ModSelL	Module Select
9	LVTTL-I	ResetL	Module Reset
10		VccRx	+3.3V Power Supply Receiver
11	LVC MOS-I/O	SCL	TWI serial interface clock
12	LVC MOS-I/O	SDA	TWI serial interface data
13		GND	Ground
14	CML-O	Rx3p	Receiver Non-Inverted Data Output
15	CML-O	Rx3n	Receiver Inverted Data Output
16		GND	Ground
17	CML-O	Rx1p	Receiver Non-Inverted Data Output
18	CML-O	Rx1n	Receiver Inverted Data Output
19		GND	Ground
20		GND	Ground
21	CML-O	Rx2n	Receiver Inverted Data Output
22	CML-O	Rx2p	Receiver Non-Inverted Data Output
23		GND	Ground
24	CML-O	Rx4n	Receiver Inverted Data Output
25	CML-O	Rx4p	Receiver Non-Inverted Data Output
26		GND	Ground
27	LVTTL-O	ModPrsL	Module Present
28	LVTTL-O	IntL/RxLOS	Interrupt/optional Rx Loss
29		VccTx	+3.3V Power supply transmitter
30		Vcc1	+3.3V Power supply
31	LVTTL-I	LPMode/Tx Dis	LP MODE/optional Tx Disable

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32		GND	Ground
33	CML-I	Tx3p	Transmitter Non-Inverted Data Input
34	CML-I	Tx3n	Transmitter Inverted Data Input
35		GND	Ground
36	CML-I	Tx1p	Transmitter Non-Inverted Data Input
37	CML-I	Tx1n	Transmitter Inverted Data Input
38		GND	Ground
39		GND	Ground
40	CML-I	Tx6n	Transmitter Inverted Data Input
41	CML-I	Tx6p	Transmitter Non-Inverted Data Input
42		GND	Ground
43	CML-I	Tx8n	Transmitter Inverted Data Input
44	CML-I	Tx8p	Transmitter Non-Inverted Data Input
45		GND	Ground
46	LVC MOS/CML I	P/VS4	Programmable/Module Vendor Specific 4
47	LVC MOS /CML-I	P/VS1	Programmable/Module Vendor Specific 1
48		VccRx1	3.3V Power Supply
49	LVC MOS /CML-O	P/VS2	Programmable/Module Vendor Specific 2
50	LVC MOS /CML-O	P/VS3	Programmable/Module Vendor Specific 3
51		GND	Ground
52	CML-O	Rx7p	Receiver Non-Inverted Data Output
53	CML-O	Rx7n	Receiver Inverted Data Output
54		GND	Ground
55	CML-O	Rx5p	Receiver Non-Inverted Data Output
56	CML-O	Rx5n	Receiver Inverted Data Output
57		GND	Ground
58		GND	Ground
59	CML-O	Rx6n	Receiver Inverted Data Output
60	CML-O	Rx6p	Receiver Non-Inverted Data Output
61		GND	Ground

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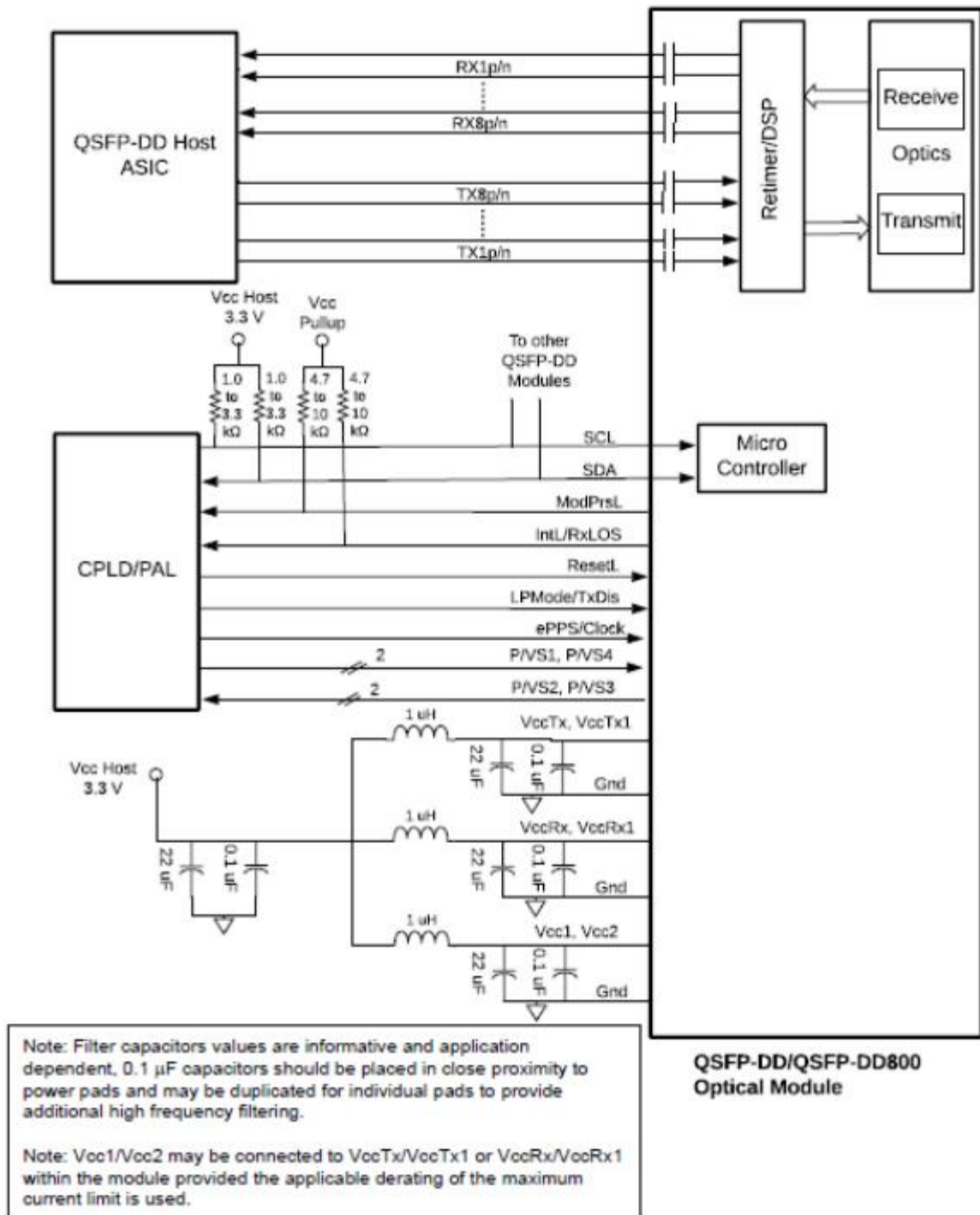
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62	CML-O	Rx8n	Receiver Inverted Data Output
63	CML-O	Rx8p	Receiver Non-Inverted Data Output
64		GND	Ground
65		NC	No Connect
66		Reserved	For future use
67		VccTx1	3.3V Power Supply
68		Vcc2	3.3V Power Supply
69	LVCMS-I	ePPS/Clock	1PPS PTP clock or reference clock input
70		GND	Ground
71	CML-I	Tx7p	Transmitter Non-Inverted Data Input
72	CML-I	Tx7n	Transmitter Inverted Data Input
73		GND	Ground
74	CML-I	Tx5p	Transmitter Non-Inverted Data Input
75	CML-I	Tx5n	Transmitter Inverted Data Input
76		GND	Ground

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Recommended QSFP-DD/QSFP-DD800 Host Board Schematic



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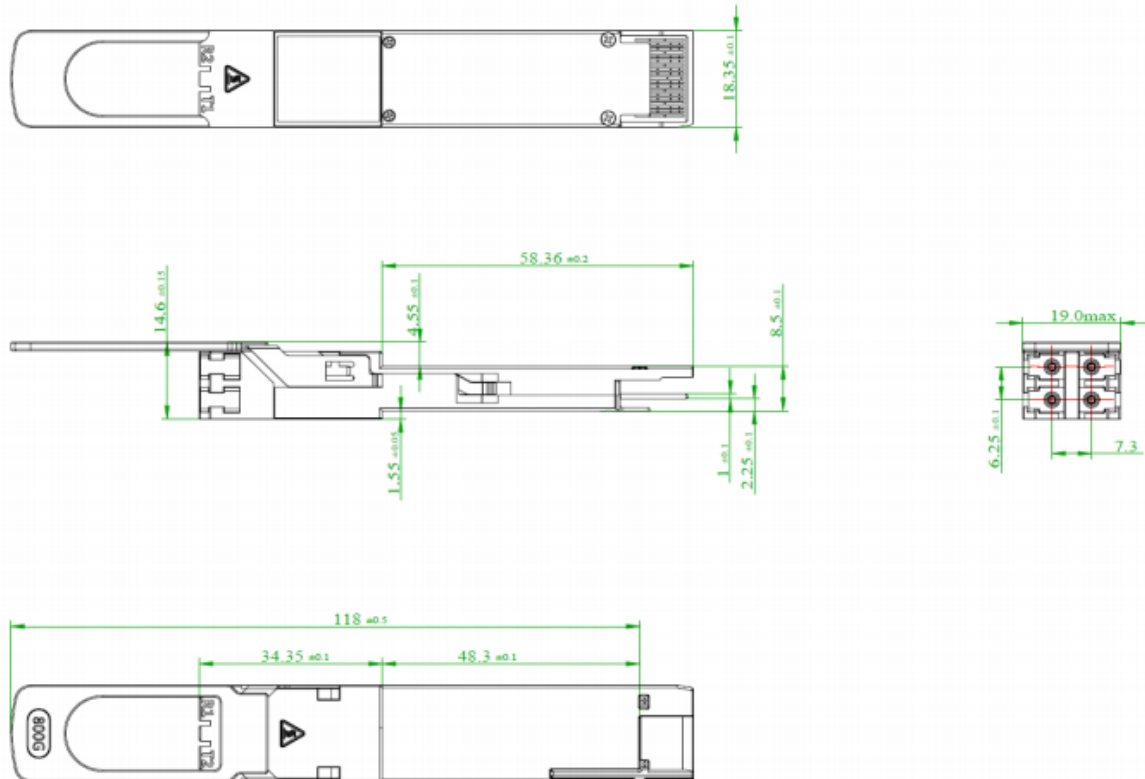
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9. Digital Diagnostic Functions

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

Parameter	Symbol	Min	Max	Unit	Notes
Temperature monitor absolute error(0~70 °C)	DMI_Temp	-3	+3	degC	Over operating temp
Supply voltage monitor absolute error(3.13~3.47V)	DMI_VCC	-0.1	0.1	V	Full operating range
Channel RX power monitor absolute error(-9~+5.1dB)	DMI_RX	-3	3	dB	Per channel
Channel Bias current monitor(0~100mA)	DMI_Ibias	-10%	10%	mA	Per channel
Channel TX power monitor absolute error(-2.7~+5.1dB)	DMI_TX	-3	3	dB	Per channel

10. Mechanical Dimensions



11. Module Ordering information

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