

TITLE 400G QSFP-DD SR4 Transceiver	DOC No. RFD-20260206100-001	
	REVISION : 01	AUTHORIZED BY : Andy Yang
	DATE : 2026.02.06	CLASSIFICATION : Optics Transceiver

1. General Description

This product is a 400Gb/s QSFP-DD400 400G SR4 optical module designed for 100m optical communication applications. The module converts 8 channels of 50Gb/s (PAM4) electrical input data to 4 channels of parallel optical signals, each capable of 100Gb/s operation for an aggregate data rate of 400Gb/s.

On the receiver side, The module converts four 100Gb/s parallel optical signals into eight (PAM4) electrical output data, each running at 50Gb/s, for a total data rate of 400Gb/s.

An optical fiber cable with an MTP/MPO-12 connector can be plugged into the QSFP- DD400 400G SR4 module receptacle. Host FEC is required to support up to 100m fiber transmission.

2. PRODUCT FEATURES

- Compliant to QSFP-DD/QSFP-DD800/QSFP112 HWRev 6.2
- Compliant with CMIS 4.0
- Parallel 4 Optical Lanes
- IEEE 802.3db 400GBASE-SR4 Specification compliant
- 8x53.125Gb/s electrical interface (400GAUI-8)
- Up to 100m transmission with OM4 MMF
- Maximum power consumption 9W
- MPO-12 Receptacle
- Single +3.3V power supply
- Case temperature range: 0 ~ +70°C

RoHS 2.0 complain

3. PRODUCT DESCRIPTION

3.1 PRODUCT NAME

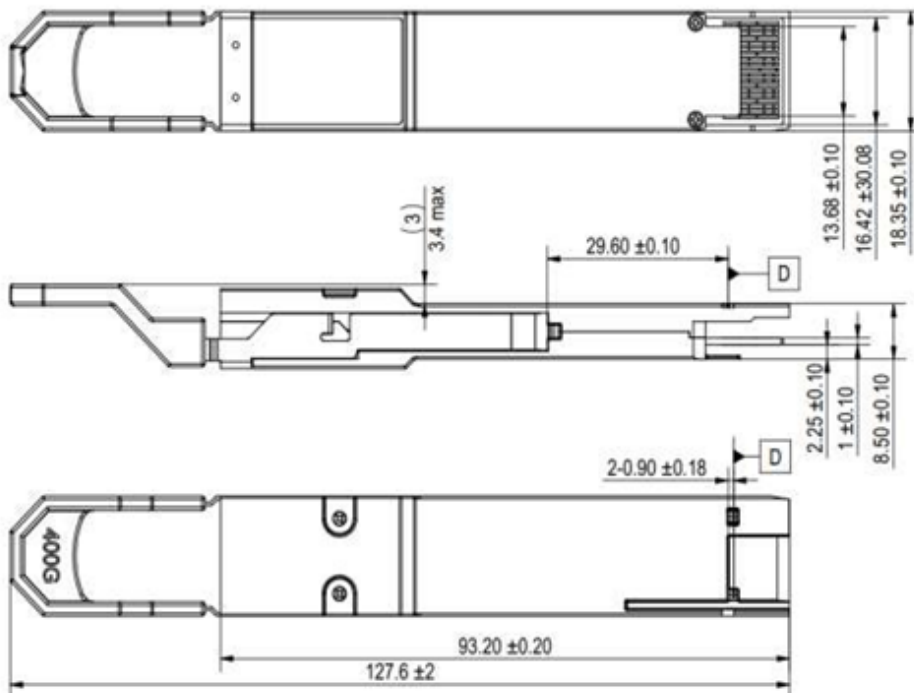
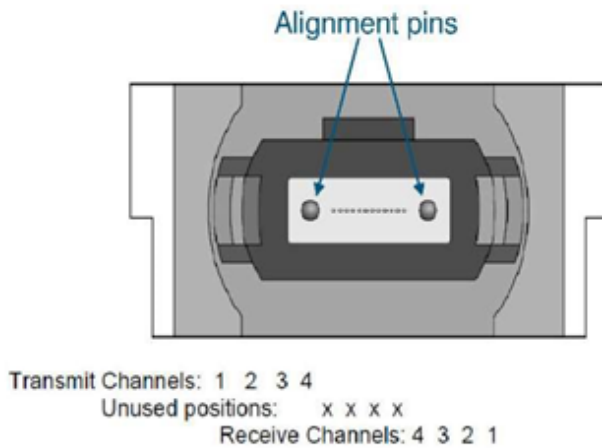
400G QSFP-DD SR4

JPC P/N	Wavelength (nm)	Distance	Fiber Type	Power (dBm)	Sen. (dBm)	Connector	Tem.
P66**4GRCAS1-1	850	100m	MMF	-4.6~4	-4.6	MPO-12	C

Notes : ** Indicates the customer code.

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3.2 DIMENSIONS,MATERIALS,PLATINGS AND MARKING



Unit : mm

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4. APPLICABLE DOCUMENTS AND SPECIFICATIONS

- 400G Ethernet
- Data Center Interconnect
- Enterprise Networking

5. Absolute Maximum Ratings

Parameter	Symbol	Min	Max	Units
Storage Temperature Range	T _{STG}	-40	+85	°C
Supply Voltage	V _{CC}	0.5	3.6	V
Relative Humidity	RH	10% to 90% non-condensing		

7. Operating Conditions

Parameter	Symbol	Min	Max	Unit
Case Temperature- Operating	T _{CASE}	0	70	°C
Supply Voltage	V _{CC}	3.135	3.465	V
Power Consumption	P _{DISS}		9	W
Pre-FEC Bit Error Ratio			2.4x10 ⁻⁴	
Link Distance over OM3		0.5	60	M
Link Distance over OM4		0.5	100	M

8. Transmitter Optical Specifications

Transmitter Parameter	Min	Typical	Max	Unit
Signaling rate each lane	53.125 ± 100ppm			GBd
Lane Wavelength Range		850		nm

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RMS Spectral width			0.6	nm
Modulation Format	PAM4			
Average Optical Power per lane	-4.6		4	dBm
Outer Optical Modulation Amplitude (OMA _{outer}), each lane for TDECQ≤1.8dB for 1.8<TDECQ≤4.4dB	-2.6 -4.4+TDECQ		3.5 3.5	dBm
Outer Optical Modulation Amplitude (OMA _{outer}), each lane for TECQ≤1.8dB for 1.8<TECQ≤4.4dB	-2.6 -4.4+TECQ		3.5 3.5	dBm
Transmitter and Dispersion Eye Closure for PAM4, each Lane			4.4	dB
Transmitter Eye Closure for PAM4(TECQ), each Lane			4.4	dB
Extinction Ratio	2.5			dB
Tranmitter excursion ,each lane			2	dB
Trasmitter transition time,each lane			17	ps
Average Launch Power per Lane @ TX Off State			-30	dBm
Relative Intensity Noise ₁₂ (OMA)			-131	dB/Hz
Optical Return Loss Tolerance			12	dB
Encircled Flux	≥86% at 19μm ≤30% at 4.5μm			dB

9. Receiver Optical Specifications

Receiver Parameter	Min	Typical	Max	Unit
Signaling rate each lane	53.125 ± 100ppm			GBd
Lane Wavelength Range		850		nm
Modulation Format	PAM4			
Damage Threshold	5			dBm

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Average Receive Power, each lane	-6.4		4	dBm
Receiver Power, each lane (OMA)			3.5	dBm
Receiver Sensitivity each lane (OMA _{outer}) for TECQ≤1.8dB for 1.8<TECQ≤4.4dB			-4.6 -6.4+TECQ	dBm
Receiver reflectance			-12	dB
Stressed Receiver Sensitivity (OMA _{outer}), each			-2	dBm
Stressed Conditions for Stress Receiver Sensitivity				
Stressed Eye Closure for PAM4 (SECQ), Lane under Test		4.4		dB
OMA _{outer} of each Aggressor Lane		3.5		dBm

10. Receiver Thresholds for Loss of Signal (LOS)

Parameter	Min	Typical	Max	Unit
RX_LOS_Assert Min/Max	-15.0			dBm
RX_LOS_De-Assert Min/Max			-8.9	dBm
RX_LOS_Hysteresis		1.5		dB

11. Digital Diagnostic Monitoring Specifications

Parameters	Unit	Specification
Temperature Monitor absolute error	° C	± 3
Supply Voltage Monitor absolute error	%	± 5
I _{bias} Monitor absolute error	%	± 10
Received Power (Rx) Monitor absolute error	dB	± 3.0
Transmit Power (Tx) Monitor absolute error	dB	± 3.0

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12. Low Speed Electrical signal

Parameter	Symbol	Min	Max	Units	Condition
SCL and SDA	VOL	0	0.4	V	IOL(max)=3.0mA for fast mode,20mA for Fast-mode plus
	VOH	Vcc-0.5	Vcc+0.3	V	
SCL and SDA	VIL	-0.3	Vcc*0.3	V	
	VIH	Vcc*0.7	Vcc +0.5	V	
Capacitance for SCL and SDA I/O pin	Ci		14	pF	
Total bus capacitive load for SCL and SDA	Cb		100	pF	3.0k Ohms Pull up resistor,max
			200	pF	1.6k Ohms Pull up resistor,max
LPMode/TxDis,Reset and ModeSeIL	VIL	-0.3	0.8	V	Iin <= 125uA for Vin < Vcc
	VIH	2	Vcc + 0.3	V	
IntL/RxLOS	VOL	0	0.4	V	IOL=2.0mA
	VOH	VCC - 0.5	VCC + 0.3	V	10k ohms pull-up to Host Vcc
ModPrsL	VOL	0	0.4	%	IOL=2.0mA
	VOH				ModPrsL can be implemented as a short-circuit to GND on the module

13. Low Speed Electrical signal

Parameter	Min	Typical	Max	Unit	Notes
Receiver electrical output characteristics at TP4					
Signaling rate per lane		26.5625		GBd	
AC common-mode output voltage(RMS)		-	17.5	mV	

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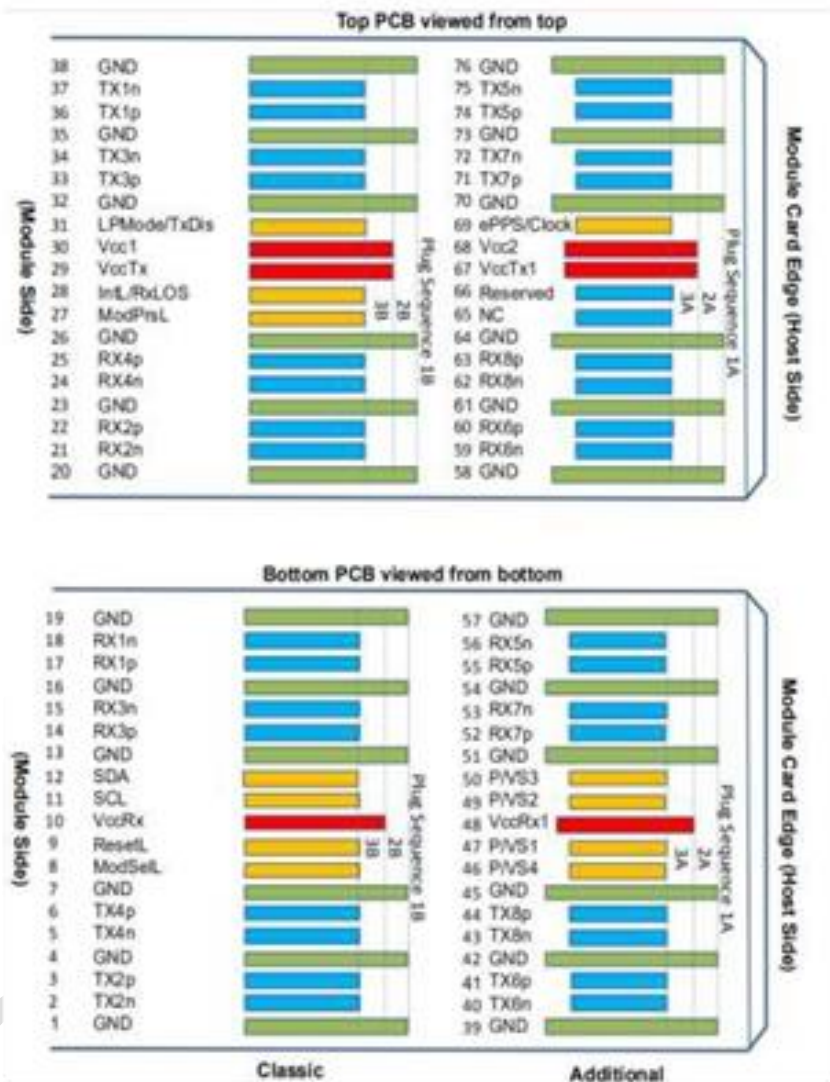
Differential peak-to-peak output voltage			900	mV	
Near-end ESMW (Eye symmetry mask width)		TBD		UI	
Near-end Eye height, differential	24			mV	
Near-end vertical eye closure			7.5	dB	
Far-end ESMW (Eye symmetry mask width)		TBD		UI	
Far-end Eye height, differential	24			mV	
Far-end vertical eye closure			7.5	dB	
Far-end pre-cursor ISI ratio		TBD		%	
Common mode to differential conversion return loss	802.3ck 120G-1			dB	
Effective return loss	TBD			dB	
Differential termination mismatch			10	%	
Transition time (min, 20% to 80%)		TBD		ps	
DC common mode voltage	-350		2850	mV	
Transmitter electrical input characteristics at TP1					
Signaling rate, per lane		26.5625		GBd	

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Differential pk-pk input voltage tolerance	900		mV	
Common-mode to differential return loss	802.3ck Equation(120G-1)			
Effective return loss	TBD			
Differential termination mismatch			10 %	
Module stressed input test	See 120G.3.4.1			
Single-ended voltage tolerance range	-0.4		3.3 V	
DC common-mode voltage	-350	2850	mV	

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14. QSFP-DD400 400G SR4 Edge Connector and Pinout



Module contact definition

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Pad Function Definition

Pad	Logic	Symbol	Description	Plug Sequence ⁴	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	2WI serial interface clock	3B	
12	LVC MOS-I/O	SDA	2WI 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/ RxLOS	Interrupt/optional RxLOS	3B	
29		VccTx	+3.3V Power supply transmitter	2B	2
30		Vcc1	+3.3V Power supply	2B	2
31	LVTTL-I	LPMode/ TxDis	Low Power mode/optional TX Disable	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

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Pad	Logic	Symbol	Description	Plug Sequence ⁴	Notes
46	LVC MOS /CML-I	P/VS4	Programmable/Module Vendor Specific 4	3A	5
47	LVC MOS /CML-I	P/VS1	Programmable/Module Vendor Specific 1	3A	5
48		VccRx1	3.3V Power Supply	2A	2
49	LVC MOS /CML-O	P/VS2	Programmable/Module Vendor Specific 2	3A	5
50	LVC MOS /CML-O	P/VS3	Programmable/Module Vendor Specific 3	3A	5
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	LVC MOS-I	ePPS/Clock	1PPS PTP clock or reference clock input	3A	6
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

Note 1: QSFP-DD uses common ground (GND) for all signals and supply (power). 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. Each connector Gnd contact is rated for a steady state current of 500 mA.

Note 2: VccRx, VccRx1, Vcc1, Vcc2, VccTx and VccTx1 shall be applied concurrently. Supply requirements defined for the host side of the Host Card Edge Connector are listed in Table 13. For power classes 4 and above the module differential loading of input voltage pads must not result in exceeding contact current limits. Each connector Vcc contact is rated for a steady state current of 1500 mA.

Note 3: Reserved and no Connect pads recommended to be terminated with 10 k Ω to ground on the host. Pad 65 (No Connect) shall be left unconnected within the module.

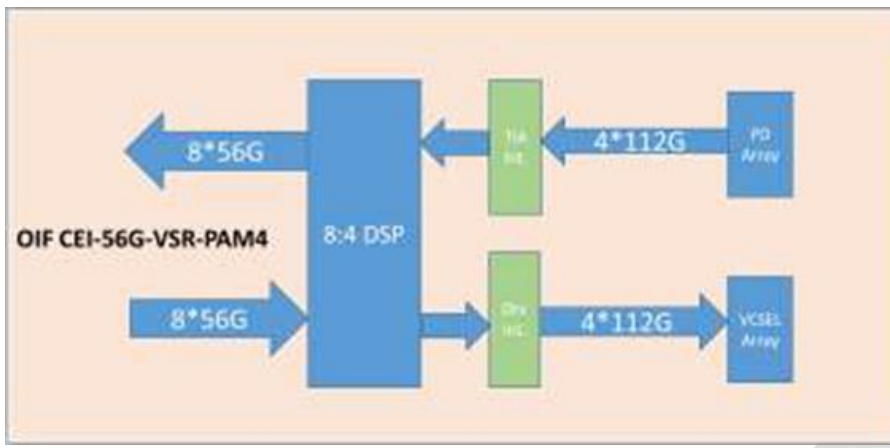
Note 4: Plug Sequence specifies the mating sequence of the host connector and module. The sequence is 1A, 2A, 3A, 1B, 2B, 3B. (see Figure 2 for pad locations) Contact sequence A will make, then break contact with additional QSFP-DD pads. Sequence 1A and 1B will then occur simultaneously, followed by 2A and 2B, followed by 3A and 3B.

Note 5: Full definitions of the P/VSx signals currently under development. On new designs not used P/VSx signals are recommended to be terminated on the host with 10 k Ω .

Note 6: ePPS/Clock if not used recommended to be terminated with 50 Ω to ground on the host.

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Module Block Diagram



8.Modification History

Rev.	Comments	Date	Originator	Approval
01	Preliminary Draft	2026.02.06	Andy Yang	Mike Sun