

400G OSFP112 RHS DR4 500 m Transceiver Module P/N: WST-OR4-DR4-C



Features:

- OSFP RHS form factor
- 400Gb/s aggregate data rate
- 4 × 106.25 Gb/s PAM4 optical interface
- 4 × 106.25 Gb/s PAM4 electrical interface
- Four-channel PAM4 SIP Modulator transmitters and receivers
- Single MPO-12/APC optical connector
- 500m optical interface over single-mode fiber
- Hot pluggable
- Single 3.3 V power supply
- Power consumption: 9 W (Max.)
- Operating case temperature: 0 °C to +70 °C
- International class 1 laser safety certified

Standards:

- IEEE 802.3df compliant
- IEEE P802.3ck™/D3.0 compliant
- CMIS Rev 5.2 compliant
- OSFP MSA V5.0 compliant
- RoHS compliant

Applications:

- Deployment in platforms supporting Ethernet and InfiniBand networking architectures
- Data center interconnects
- Switch-to-switch and switch-to-router interconnections

Description

The module is a hot-pluggable 400G OSFP112 RHS DR4 optical transceiver designed for high-speed data communication applications. The module supports four duplex channels operating at 106.25 Gb/s PAM4, providing an aggregate data rate of up to 400 Gb/s and transmission distances of up to 500 meters over single-mode fiber. The transceiver integrates high-performance silicon photonics (SiPh) modulators and uses an MPO-12 APC optical interface.

Functional Description

The module employs a silicon photonics–based optical architecture utilizing a 4×106.25 Gb/s PAM4 SIP modulator with four parallel optical channels. On the transmit side, PAM4 electrical signals from the host interface are processed by an internal CDR (Clock and Data Recovery) and used to drive the optical modulators. The modulated signals are coupled to the fiber through a single MPO-12 APC connector receptacle.

On the receive side, the incoming optical signals are detected by PIN detectors and processed by the CDR to recover the electrical data streams. The electrical host interface supports four PAM4 lanes compliant with IEEE P802.3ck standards, ensuring reliable transmission for 400G Ethernet and InfiniBand applications.

Absolute Maximum Ratings

Parameter	Symbol	Min	Typ.	Max	Unit
Storage Temperature Range	TS	-40		+85	°C
Power Supply Voltage	Vcc	-0.3		+3.6	V
Relative Humidity	RH	5		85	%

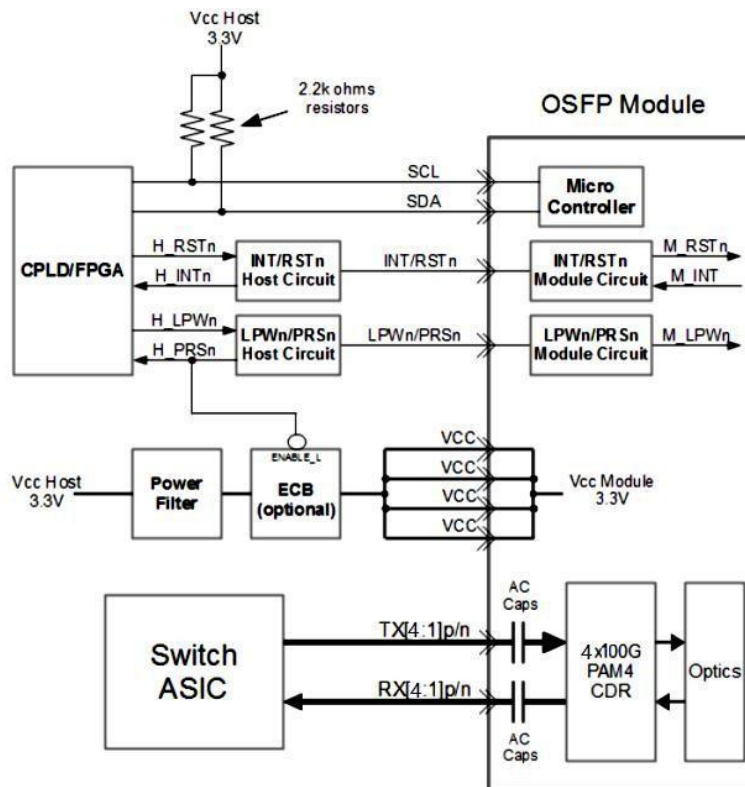
Recommended Operating Conditions

Parameter	Symbol	Min	Typ.	Max	Unit
Case operating Temperature Range	TC	0		70	°C
Power Supply Voltage	Vcc	+3.135	3.3	+3.465	V

Specifications (Tested under recommended operating conditions, unless otherwise noted)

Parameter	Symbol	Min	Typ.	Max	Unit	Note
Transmitter (per lane)						
Signaling Rate (per lane)		53.125 ± 100 ppm			GBd	
Modulation format		PAM4				
Lane wavelength		1,304.5	1311	1,317.5	nm	
Side-mode suppression Ratio	SMSR	30			dB	
Average launch power (per lane)	TXPx	-2.9		4	dBm	
Outer Optical Modulation Amplitude per Lane	OMA _{outer}	-0.8		4.2	dBm	
Launch power in OMA _{outer} minus TDECQ (per lane)		-2.2			dBm	
Transmitter and dispersion penalty eye closure for PAM4 (per lane)	TDECQ			3.4	dB	
Average Launch Power of Off Transmitter (per lane)				-15	dBm	
Optical Extinction Ratio	ER	3.5			dB	

Transmitter transition time				17	ps	
RIN21.4OMA				-136		
Optical Return Loss Tolerance	ORL			21.4		
Transmitter reflectance				-26		
Receiver (per lane)						
Signaling Rate (per lane)				53.125 ± 100 ppm	GBd	
Modulation format				PAM4		
Lane wavelength		1,304.5	1311	1,317.5	nm	
Damage Threshold (per lane)	DT		5			dBm
Average receive power (per lane)	RXPx		-5.9		4	dBm
Receive power OMAouter (per lane)	OMAouter				4.2	dBm
Receiver reflectance	Rfl				-26	dB
Receiver sensitivity (OMAouter) (per lane)					-4.4	dBm @1E-6
Stressed sensitivity (OMAouter) (per lane)	S				-1.9	dBm
Conditions of stressed receiver sensitivity test:						
Stressed eye closure for PAM4 (SECQ)				3.4		dB
SECQ-10log10(Ceq)f(max)				3.4		dB
OMAouter of each aggressor lane				4.2		dBm 3

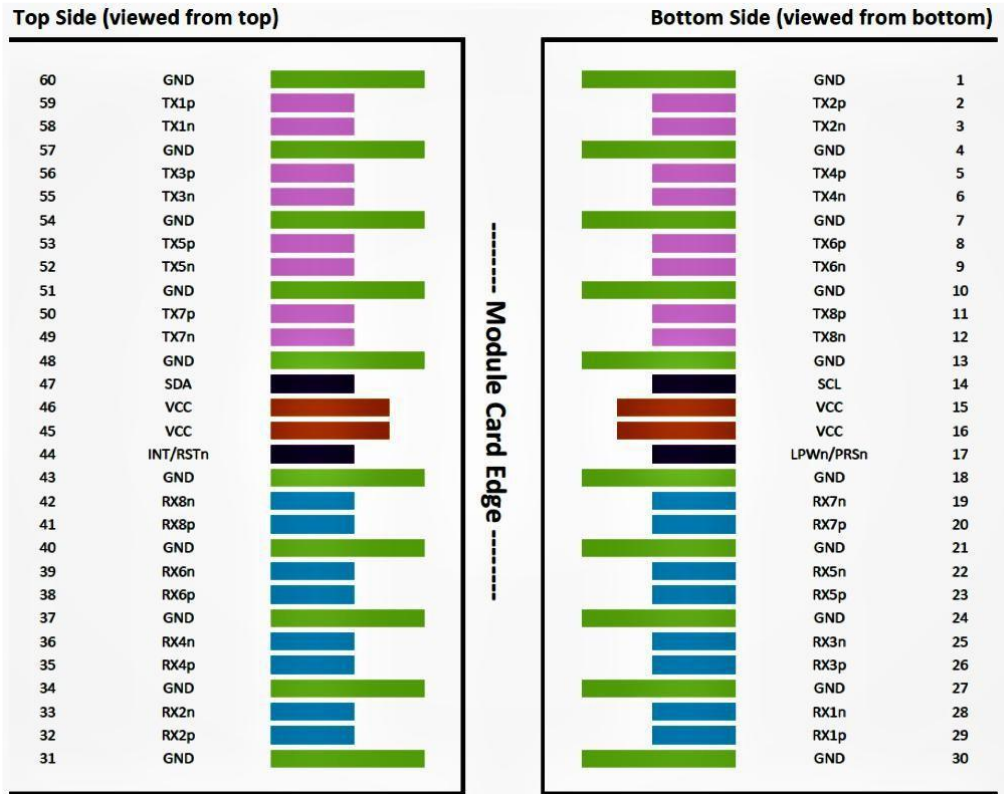


Module Principle Diagram

Electric Ports Definition

Parameter	Min	Typ.	Max	Unit	Notes
Supply Voltage	3.135		3.465	V	
Signaling Rate (per lane)	53.125 ± 100 ppm			GBd	
Module input characteristics at TP1					
Differential pk-pk voltage tolerance (min)	750			mV	TP1a
Peak-to-peak AC common-mode voltage tolerance					
Low-frequency, VCMLF		32		mV	TP1a
Full-band, VCMFB		80			
Differential Termination Mismatch			10	%	TP1
Module stressed input tolerance		See IEEE P802.3ck™ /D3.0120G.3.4.3			TP1a
Single-ended voltage tolerance	-0.4		3.3	V	TP1a
DC common-mode voltage tolerance	-0.35		2.85	V	TP1
Module output characteristics at TP4					
Peak-to-peak AC common-mode voltage (max)					
Low-frequency, VCMLF		32		mV	TP4
Full-band, VCMFB		80			
Differential peak-to-peak output voltage (max)					
Short mode		600		mV	TP4
Long mode		845			
Eye height	15			mV	TP4
Vertical eye closure, VEC			12	dB	TP4
Differential Termination Mismatch			10	%	TP4
Transition time	8.5			ps	TP4
DC common-mode voltage tolerance	-0.35		2.85	V	TP4
IIC communication					
IIC Clock frequency	100		1,000	kHz	
Clock stretching			500	us	
Data in hold time	0			us	
Data in setup time	0.1			us	

Pin Assignment



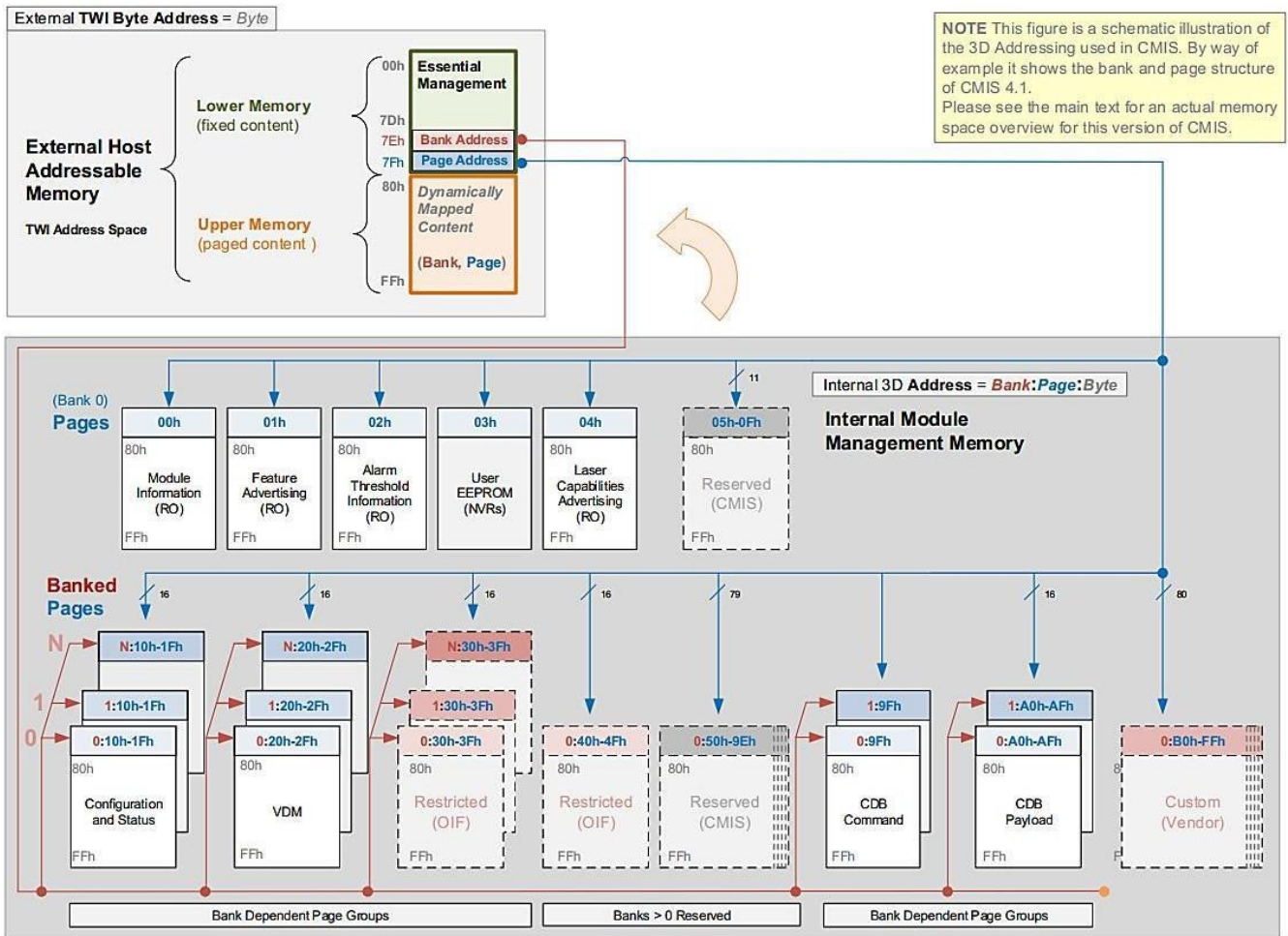
Electrical Pin-out Details

Pin	Logic	Symbol	Name/Description	Note
1		GND	Ground	
2	CML-I	Tx2p	Transmitter Data Non-Inverted	
3	CML-I	Tx2n	Transmitter Data Inverted	
4		GND	Ground	
5	CML-I	Tx4p	Transmitter Data Non-Inverted	
6	CML-I	Tx4n	Transmitter Data Inverted	
7		GND	Ground	
8	CML-I	Tx6p	Transmitter Data Non-Inverted	Unused in 400G Mode
9	CML-I	Tx6n	Transmitter Data Inverted	Unused in 400G Mode
10		GND	Ground	
11	CML-I	Tx8p	Transmitter Data Non-Inverted	Unused in 400G Mode
12	CML-I	Tx8n	Transmitter Data Inverted	Unused in 400G Mode
13		GND	Ground	
14	LVC MOS-I/O	SCL	2-wire Serial interface clock	Open-Drain with pull up resistor on Host
15		VCC	+3.3V Power	
16		VCC	+3.3V Power	

17	Multi-Level	LPWn/PRSn	Low-Power Mode / Module Present	See pin description
18		GND	Ground	
19	CML-O	Rx7n	Receiver Data Inverted	Unused in 400G Mode
20	CML-O	Rx7p	Receiver Data Non-Inverted	Unused in 400G Mode
21		GND	Ground	
22	CML-O	Rx5n	Receiver Data Inverted	Unused in 400G Mode
23	CML-O	Rx5p	Receiver Data Non-Inverted	Unused in 400G Mode
24		GND	Ground	
25	CML-O	Rx3n	Receiver Data Inverted	
26	CML-O	Rx3p	Receiver Data Non-Inverted	
27		GND	Ground	
28	CML-O	Rx1n	Receiver Data Inverted	
29	CML-O	Rx1p	Receiver Data Non-Inverted	
30		GND	Ground	
31		GND	Ground	
32	CML-O	Rx2p	Receiver Data Non-Inverted	
33	CML-O	Rx2n	Receiver Data Inverted	
34		GND	Ground	
35	CML-O	Rx4p	Receiver Data Non-Inverted	
36	CML-O	Rx4n	Receiver Data Inverted	
37		GND	Ground	
38	CML-O	Rx6p	Receiver Data Non-Inverted	Unused in 400G Mode
39	CML-O	Rx6n	Receiver Data Inverted	Unused in 400G Mode
40		GND	Ground	
41	CML-O	Rx8p	Receiver Data Non-Inverted	Unused in 400G Mode
42	CML-O	Rx8n	Receiver Data Inverted	Unused in 400G Mode
43		GND	Ground	
44	Multi-Level	INT/RSTn	Module Interrupt / Module Reset	See pin description
45		VCC	+3.3V Power	
46		VCC	+3.3V Power	
47	LVC MOS-I/O	SDA	2-wire Serial interface data	Open-Drain with pull up resistor on Host
48		GND	Ground	
49	CML-I	Tx7n	Transmitter Data Inverted	Unused in 400G Mode
50	CML-I	Tx7p	Transmitter Data Non-Inverted	Unused in 400G Mode
51		GND	Ground	
52	CML-I	Tx5n	Transmitter Data Inverted	Unused in 400G Mode
53	CML-I	Tx5p	Transmitter Data Non-Inverted	Unused in 400G Mode
54		GND	Ground	
55	CML-I	Tx3n	Transmitter Data Inverted	

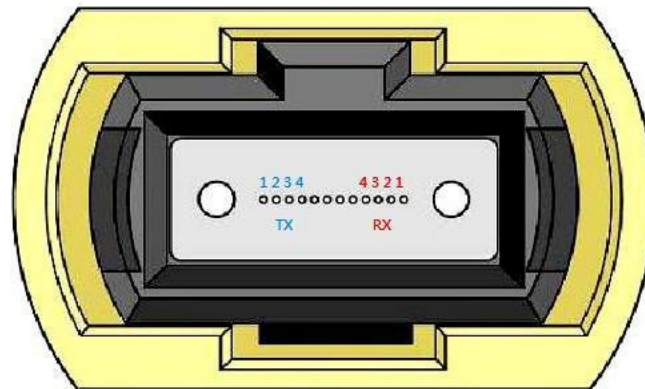
56	CML-I	Tx3p	Transmitter Data Non-Inverted	
57		GND	Ground	
58	CML-I	Tx1n	Transmitter Data Inverted	
59	CML-I	Tx1p	Transmitter Data Non-Inverted	
60		GND	Ground	

MEMORY MAP

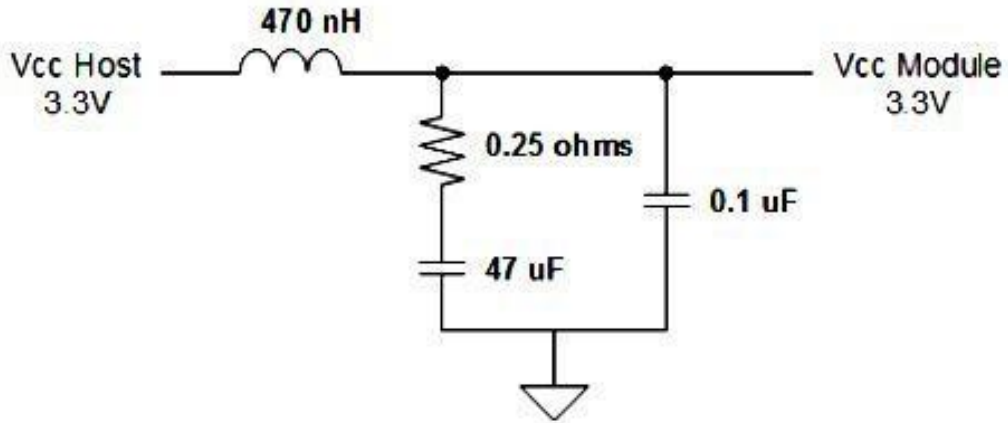


Optical Interface Lanes and Assignment

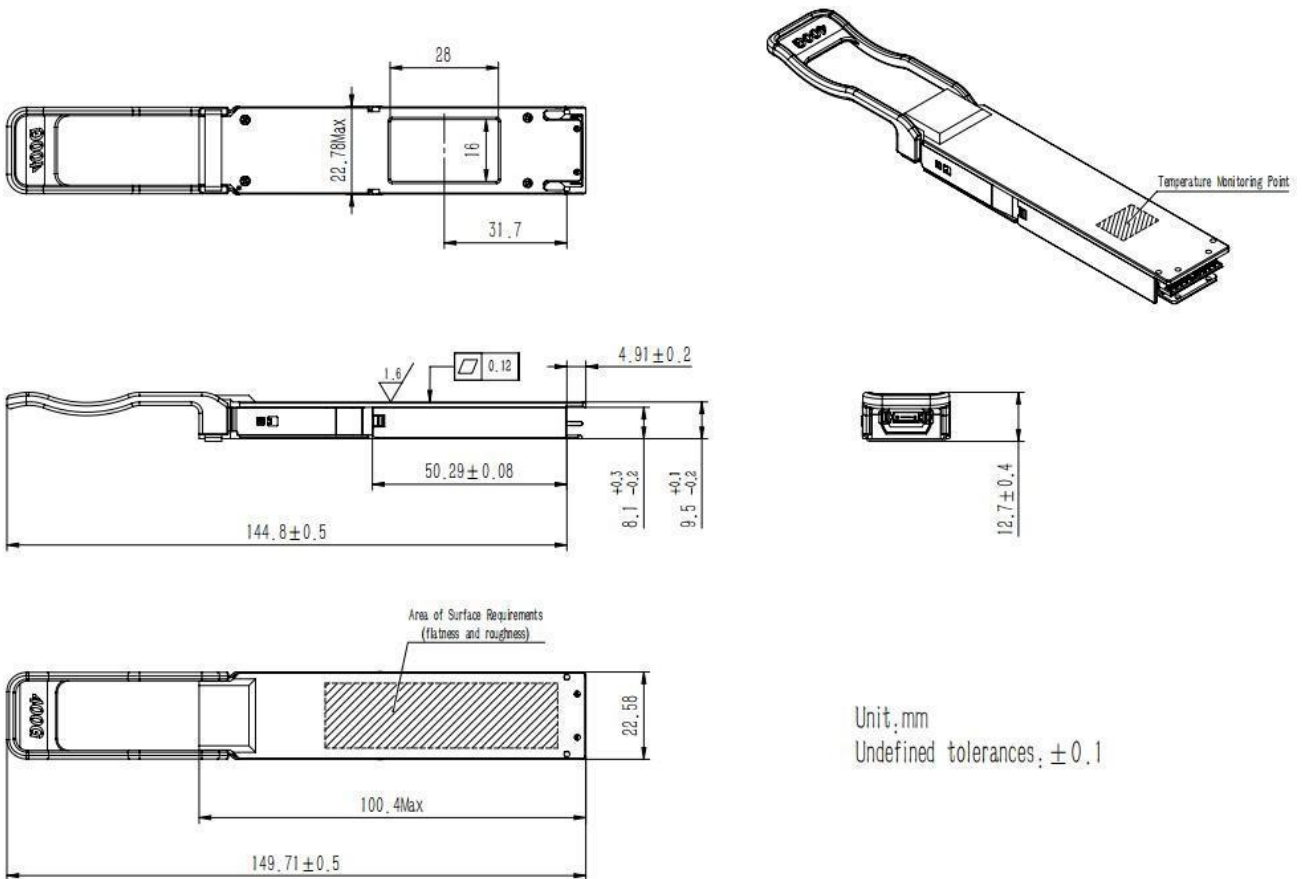
Optical interface is MPO-12 APC connector. Lane sequence is shown in figure below.



Recommended Circuit



Mechanical Drawing



Unit: mm
Undefined tolerances: ± 0.1

Ordering Information

Part No	Package	Data rate per lane	Detector	Temp	Reach	Other	Application code
WST-OR4-DR4-C	OSFP RHS	106.25 Gb/s (PAM4)	PIN	0 °C to 70 °C	500m	DDM RoHS	400G Ethernet

Modification History

Revision	Date	Description	Originator	Review	Approved
V1.0	4-MAR-2026	New Issue	Henry Chung	Wayne Liao	Tom Tang



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