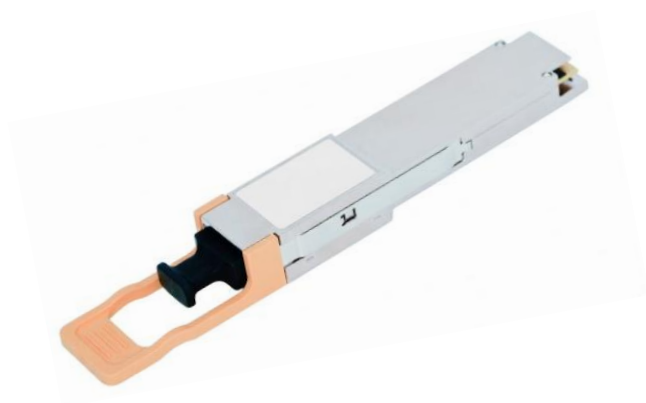


400G QSFP112 VR4 50 m Transceiver Module

P/N: WST-Q112-VR4-C



Features:

- 400G QSFP112 VR4 optical transceiver module
- Supports aggregate data rate up to 425 Gb/s
- Four electrical lanes at 106.25 Gb/s PAM4 per lane
- Four optical lanes at 106.25 Gb/s PAM4 per lane
- 53.125 GBd PAM4 signaling rate
- 850 nm VCSEL transmitter and photodetector receiver
- Transmission distance from 0.5 m to 50 m over OM4 MMF with FEC
- MPO-12/APC optical interface
- Single +3.3 V power supply
- Maximum power consumption: 8.5 W
- Digital diagnostic monitoring functions supported
- Operating case temperature: 15 °C to 70 °C
- RoHS compliant

Application:

- 400G Ethernet interconnects
- Data center interconnects
- Switch-to-switch and switch-to-router interconnects
- Short-reach optical transmission over multimode fiber

Standard:

- Compliant with IEEE 802.3db
- Compliant with IEEE 802.3ck
- Compliant with QSFP112 Multi-Source Agreement (MSA)
- Management interface compliant with CMIS 5.0 or later

Description

The WST-Q112-VR4-C is a 400G QSFP112 VR4 optical transceiver module designed for short-reach data communication and interconnect applications over multimode fiber. It supports an aggregate data rate of 425 Gb/s and transmission distance from 0.5 m to 50 m over OM4 MMF with FEC. The module uses 850 nm VCSEL transmitters and photodetector receivers and provides a 4-lane optical interface through an MPO-12/APC connector.

Function Description

The module provides four electrical lanes and four optical lanes operating at 106.25 Gb/s PAM4 per lane. The electrical interface is compliant with 400GAUI-4 requirements and supports a 53.125 GBd PAM4 signaling rate. The module integrates internal control and management functions and supports digital diagnostic monitoring through a CMIS 5.0 or later management interface. It operates from a single +3.3 V power supply with a maximum power consumption of 8.5 W and supports commercial case temperature operation from 15 °C to 70 °C.

Absolute Maximum Ratings

Parameter	Symbol	Min.	Typ.	Max.	Unit	Notes
Maximum Supply Voltage	V _{cc}	-0.5		3.6	V	
Storage Temperature	T _s	-40		85	°C	
Relative Humidity	RH	5		85	%	Non-condensing
Damage Threshold, each lane				5	dBm	1

Note 1:

The receiver shall be able to tolerate, without damage, continuous exposure to an optical input signal having this average power level on one lane. The receiver does not have to operate correctly at this input power.

Operating Environment

Parameter	Symbol	Min.	Typ.	Max.	Unit	Notes
Electrical Signal Rate, each lane		53.125 ± 100 ppm			GBd	
Optical Signal Rate, each lane		53.125 ± 100 ppm			GBd	
Supply Voltage	V _{cc}	3.135	3.3	3.465	V	
Operating Case Temp.	T _c	15		70	°C	
Power Consumption	P _c			8.5	W	
Link Distance with OM4	DI	0.5		50	m	

Electrical Characteristics

Parameter	Symbol	Min.	Typ.	Max.	Unit	Notes
High Speed Electrical Input Characteristics						
Signaling rate per lane (PAM4 encoded)	TP1	-100 ppm	53.125	+100 ppm	GBd	
Differential peak-peak input voltage tolerance	TP1a	750			mV	
AC common-mode RMS voltage tolerance	TP1a	25			mV	
Single-ended voltage tolerance	TP1a	-0.4		3.3	V	
DC common-mode voltage	TP1	-0.35		2.85	V	
High Speed Electrical Output Characteristics						

Signaling rate per lane (PAM4 Encoded)	TP4	-100 ppm	53.125	+100 ppm	GBd	
AC common-mode output voltage (RMS)	TP4			25	mV	
Differential peak-to-peak output voltage	TP4					
Short mode				600	mV	
Long mode				845		
Eye height	TP4	15			mV	
DC common-mode voltage tolerance	TP4	-0.35		2.85	V	1

Note:

1. DC common mode voltage generated by the host. Specification includes effects of ground offset voltage.

Optical Characteristics

Parameter	Symbol	Min.	Typ.	Max.	Unit	Notes
Transmitter						
Signaling rate per lane (range)		-100 ppm	53.125	+100 ppm	GBd	
Modulation format		PAM4				
Lane wavelength (range)	λ	840	-	948	nm	
RMS spectral width				0.65	nm	1
Average launch power, each lane	P	-4.6		4	dBm	2
OMA _{outer} , each lane for max (TECQ, TDECQ) ≤1.8 dB for 1.8 < max (TECQ, TDECQ) ≤ 4.4 dB	P _{OMA}	-2.6 -4.4 + max (TECQ, TDECQ)		3.5	dBm	2, 3
Transmitter and dispersion eye closure for PAM4 (TDECQ), each lane				4.4	dB	
Transmitter eye closure for PAM4 (TECQ), each lane				4.4	dB	
Extinction ratio, each lane	ER	2.5			dB	
Average launch power of OFF transmitter, each lane	P _{off}			-30	dBm	
RIN _{21OMA}	RIN			-132	dB/Hz	
Optical return loss tolerance				14	dB	
Encircled flux		≥86% at 19μm ≤30% at 4.5μm				4
Receiver						

Signaling rate per lane (range)		-100 ppm	53.125	+100 ppm	GBd	
Modulation format		PAM4				
Lane wavelength (range)	λ	840	-	948	nm	
Average receive power, each lane		-6.3		4	dBm	2, 5
Receive power, each lane (OMA _{outer})	R _{OMA}			3.5	dBm	
Receiver reflectance				-15	dB	
Receiver sensitivity (OMA _{outer}), each lane	SEN	max(-4.4, TECQ-6.2)			dBm	6
LOS Assert		-15			dBm	
LOS De-Assert				-6.6	dBm	
LOS Hysteresis		0.5			dB	
Conditions of stressed receiver sensitivity test:						7
Stressed eye closure for PAM4 (SECQ), lane under test		4.4			dB	
OMA _{outer} of each aggressor lane		3.5			dBm	

Notes:

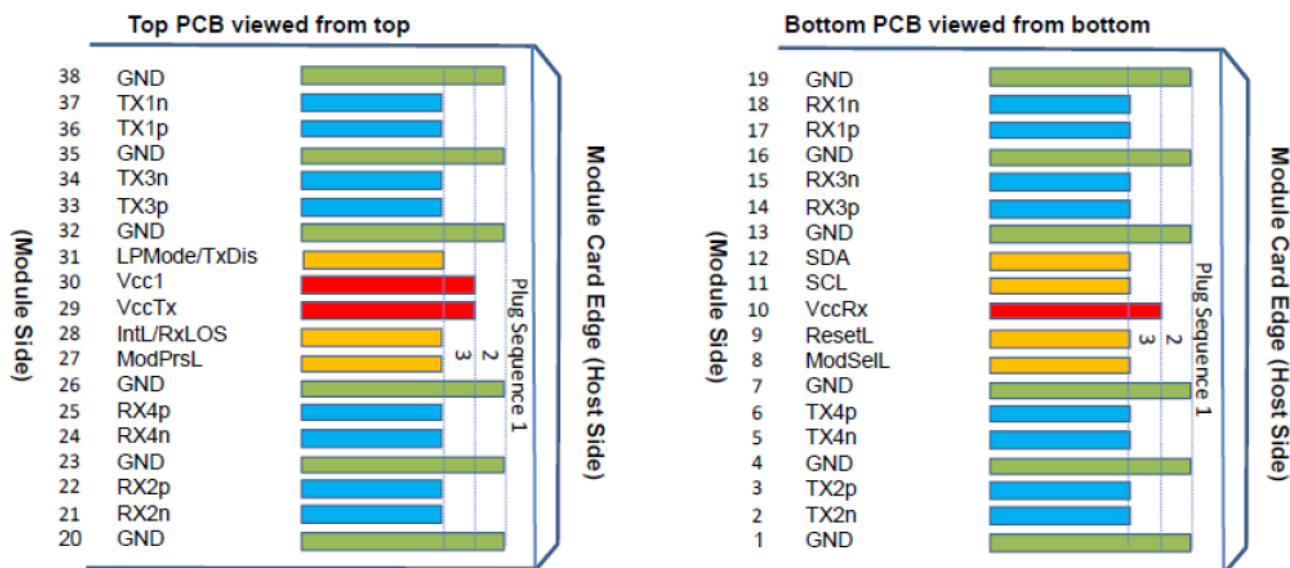
1. RMS spectral width is the standard deviation of the spectrum.
2. Editor's note: Based on stressed receiver sensitivity of -2 dBm, and may increase by up to 0.4 dB based on the choice of stressed receiver sensitivity
3. If the TDECQ < 1.4 dB, the OMA (min) has to exceed this value.
4. If measured into type A1a.2 or type A1a.3, or A1a.4, 50 μ m fiber, in accordance with IEC 61280-1-4.
5. 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.
6. Receiver sensitivity is informative and is defined for a transmitter with a value of TECQ up to 4.4 dB.
7. These test conditions are for measuring stressed receiver sensitivity. They are not characteristics of the receiver.

Digital Diagnostic Monitor Accuracy

The following characteristics are defined over recommended operating conditions

Parameter	Accuracy	Unit
Measured transceiver temperature	± 3	$^{\circ}\text{C}$
Measured transceiver supply voltage	± 3	%
Measured Tx bias current	± 10	%
Measured Tx output power	± 3	dB
Measured Rx received average optical power	± 3	dB

Pin Assignment



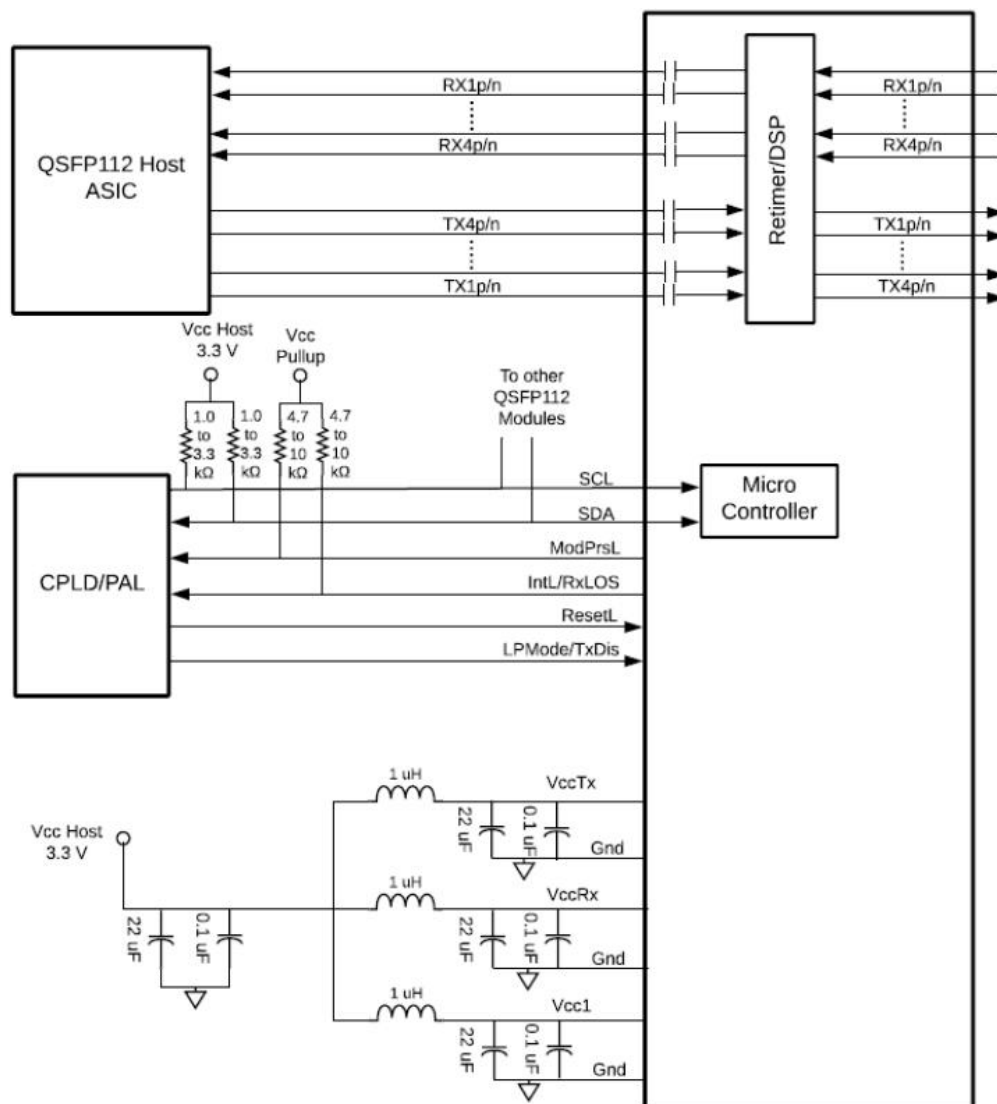
Pin out of Connector Block on Host Board

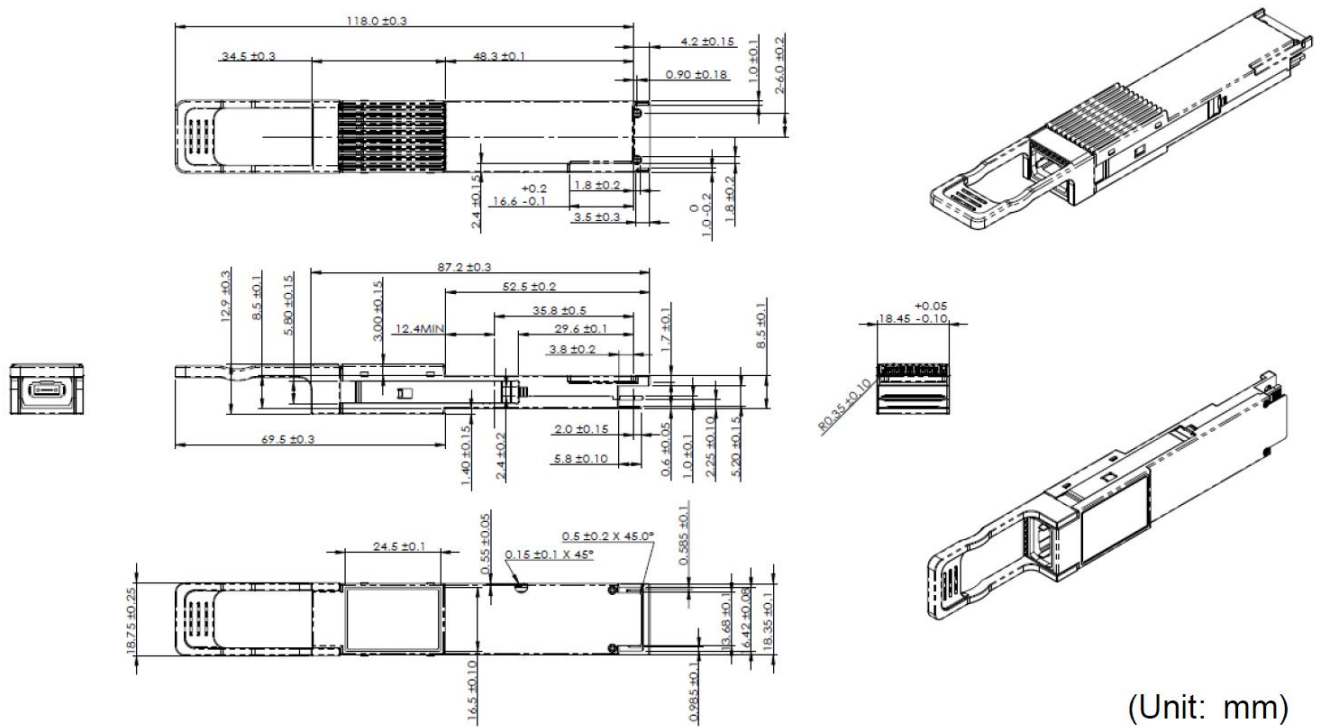
PIN	Name	Logic	Description	Plug Sequence	Notes
1	GND		Ground	1	1
2	TX2n	CML-I	Transmitter Inverted Data input	3	
3	TX2p	CML-I	Transmitter Non-Inverted Data input	3	
4	GND		Ground	1	1
5	TX4n	CML-I	Transmitter Inverted Data input	3	
6	TX4p	CML-I	Transmitter Non-Inverted Data input	3	
7	GND		Ground	1	1
8	ModSelL	LVTTL-I	Module Select	3	
9	ResetL	LVTTL-I	Module Reset	3	
10	Vcc Rx		+3.3V Power Supply Receiver	2	2
11	SCL	LVC MOS-I/O	2-wire serial interface clock	3	
12	SDA	LVC MOS-I/O	2-wire serial interface data	3	
13	GND		Ground	1	1
14	RX3p	CML-O	Receiver Non-Inverted Data Output	3	
15	RX3n	CML-O	Receiver Inverted Data Output	3	
16	GND		Ground	1	1

17	RX1p	CML-O	Receiver Non-Inverted Data Output	3	
18	RX1n	CML-O	Receiver Inverted Data Output	3	
19	GND		Ground	1	1
20	GND		Ground	1	1
21	RX2n	CML-O	Receiver Inverted Data Output	3	
22	RX2p	CML-O	Receiver Non-Inverted Data Output	3	
23	GND		Ground	1	1
24	RX4n	CML-O	Receiver Inverted Data Output	3	
25	RX4p	CML-O	Receiver Non-Inverted Data Output	3	
26	GND		Ground	1	1
27	ModPrsL	LVTTL-O	Module Present	3	
28	IntL/RxLOS	LVTTL-O	Interrupt/optional RxLOS	3	
29	Vcc Tx		+3.3V Power supply transmitter	2	2
30	Vcc1		+3.3V Power supply	2	2
31	LPMODE/TxDis	LVTTL-I	Low Power Mode/optional TX Disable	3	
32	GND		Ground	1	1
33	TX3p	CML-I	Transmitter Non-Inverted Data input	3	
34	TX3n	CML-I	Transmitter Inverted Data input	3	
35	GND		Ground	1	1
36	TX1p	CML-I	Transmitter Non-Inverted Data input	3	
37	TX1n	CML-I	Transmitter Inverted Data input	3	
38	GND		Ground	1	1

Notes:

1. GND is the symbol for signal and supply (power) common for the QSFP112 module. All are common within the QSFP112 module and all voltages are referenced to this potential unless otherwise noted. Connect these directly to the host board signal-common ground plane.
2. Vcc Rx, Vcc1 and Vcc Tx are the receiver and transmitter power supplies and shall be applied concurrently. Requirements, defined for the host side of the Host Edge Card Connector, are listed in Table 4. Recommended host board power supply filtering is shown in Figure 4. Vcc Rx, Vcc1 and Vcc Tx may be internally connected within the QSFP112 module in any combination. The connector pins are each rated for a maximum current of 1.5A (max. current of 2.0 A is required for high module power of 15-20W).

Recommended Block Diagram

Mechanical Drawing

(Unit: mm)

Ordering Information

Part No	Package	Data rate	Reach	Operating Temperature	Application Code	Note
WST-Q112-VR4-C	QSFP112	53.125 GBd (PAM4) per optical lane	50 m	15 °C to 70 °C	400G Ethernet	DDM RoHS

Modification History

Revision	Date	Description	Originator	Review	Approved
V1.0	30-May-2024	New Release	Jason Hou	Wayne Liao	Tom Tang

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