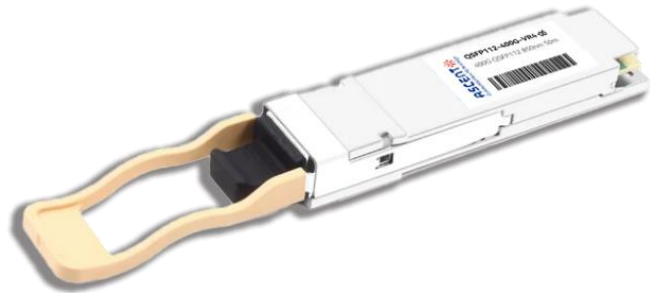


400G QSFP112 VR4

QSFP112 Series



- **100GBASE per lane in multimode fiber**
- **Data rate up to 425Gbps (4x 106.25 Gbps)**
- **Reach up to 50m on MMF (OM4)**
- **Single MPO-12 receptacle**
- **Compliant to RoHS 6/6**
- **Compliant to 400G QSFP112 MSA and CMIS4.0**

The 400G QSFP112 VR4 transceiver is a high-performance, short-reach optical module designed for next-generation 400G Ethernet and InfiniBand applications in hyperscale data center environments. Utilizing four parallel optical lanes operating at 106.25Gb/s PAM4, the module delivers an aggregate bandwidth of up to 425Gb/s over multimode fiber, supporting transmission distances of up to 50 meters on OM4 MMF. Its compact QSFP112 Type 1 form factor enables high-density deployment in modern switch, router, and AI cluster architectures.

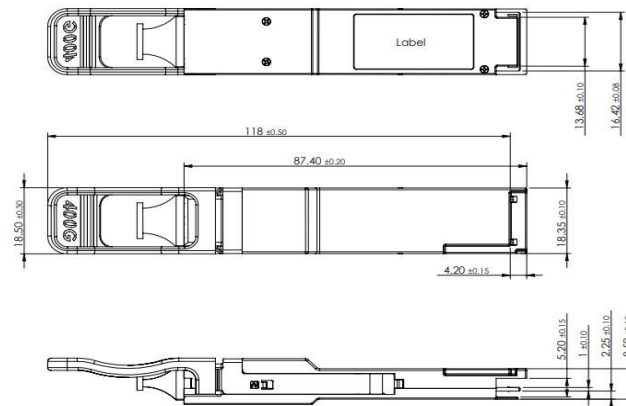
The module incorporates advanced 850nm VCSEL transmitters and PIN receivers with a high-speed 400GAUI-4 electrical interface, providing excellent signal integrity and low latency performance for demanding data center interconnect applications. The optical interface utilizes a standard MPO-12 connector, enabling efficient parallel fiber connectivity for high-speed networking infrastructure. Designed for optimized thermal and EMI performance, the transceiver supports reliable operation in dense networking systems while maintaining low power consumption.

Fully compliant with 400G QSFP112 MSA and CMIS 4.0 management interface standards, it supports comprehensive digital diagnostics and control functions for real-time system monitoring and management. Operating from a single +3.3V power supply over a commercial temperature range of 0°C to +70°C, the module is RoHS compliant and designed to meet industry Class 1 laser safety standards, making it an ideal solution for high-speed cloud, AI, and enterprise data center networks.

Key Features

- Support 100GBASE per lane in multimode fiber
- Hot-pluggable QSFP112 Type 1 form factor
- Data rate up to 425Gbps (4x 106.25 Gbps)
- Reach up to 50m on MMF (OM4)
- 850nm VCSEL laser and PIN receiver
- High speed I/O electrical interface (400GAUI-4)
- Single MPO-12 receptacle
- Operating case temperature: 0 to +70°C
- Compliant to RoHS 6/6
- Compliant to 400G QSFP112 MSA and CMIS4.0

Outline Diagram

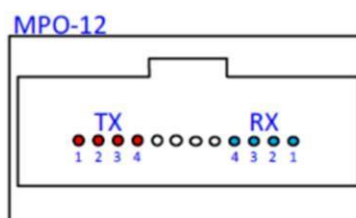


Notes:

1. All dimensions shown are in millimeters.
2. Tolerances are in accordance with QSFP112 MSA.

Optical Interface Lanes and Assignment

The recommended location and numbering of the optical ports for 3 Media Dependent Interfaces (MDI) are shown in below figure. The transmit and receive optical lanes shall occupy the positions depicted in below figure when looking into the MDI receptacle with the connector keyway feature on top.

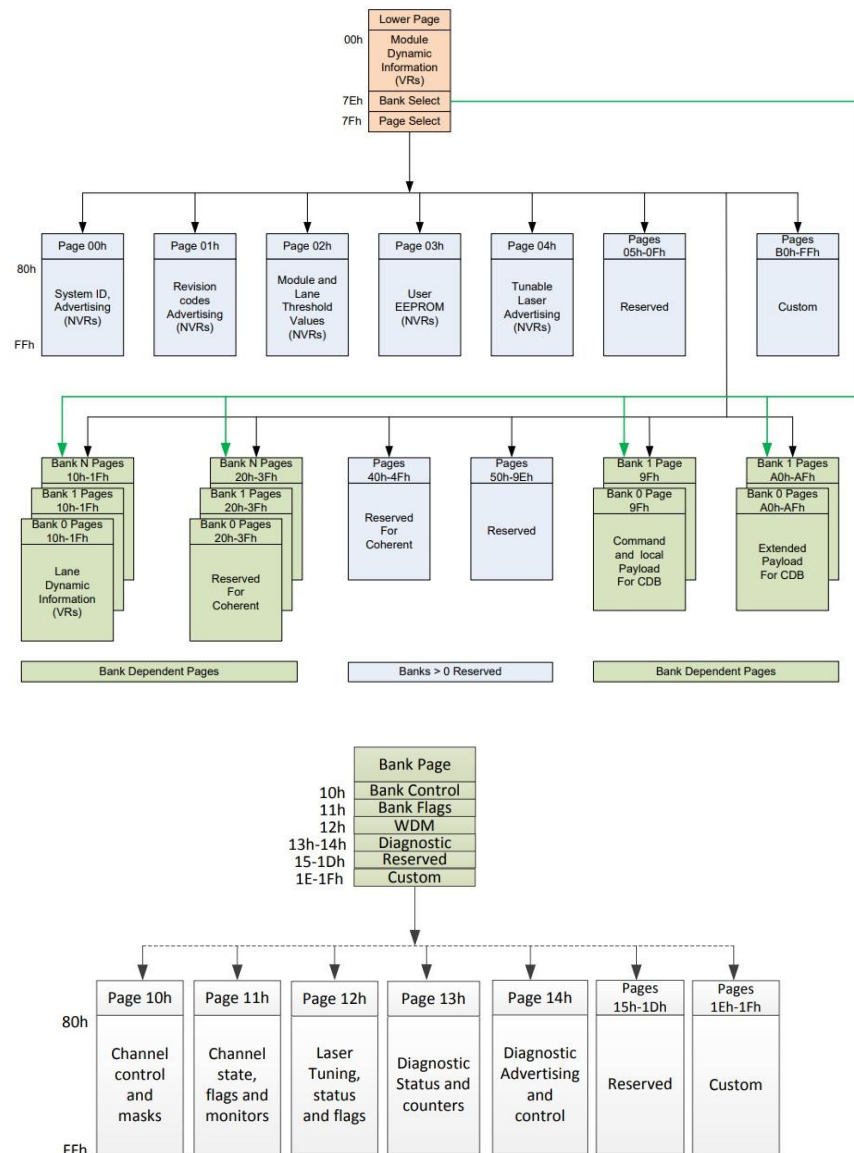


Laser Safety

All transceivers are Class 1 Laser products per FDA/CDRH and IEC-60825 standards. They must be operated under specified operating conditions.



Memory Map-4.0

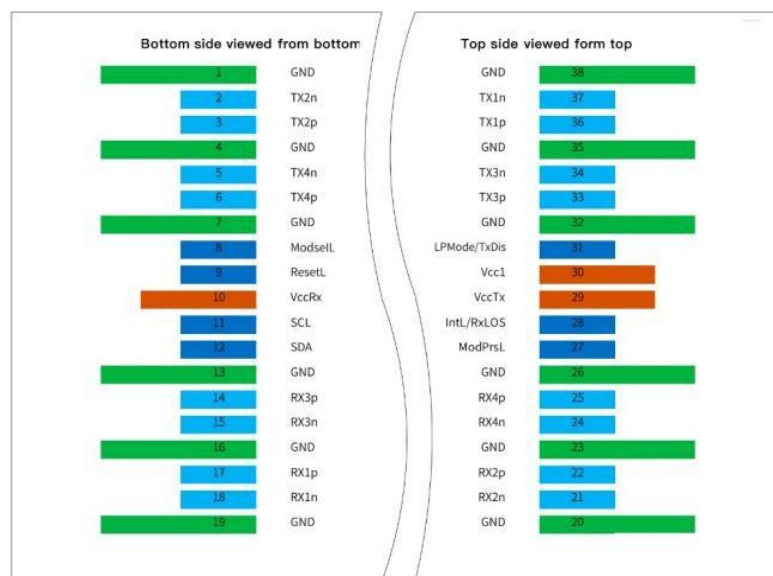


Digital Diagnostic Specification

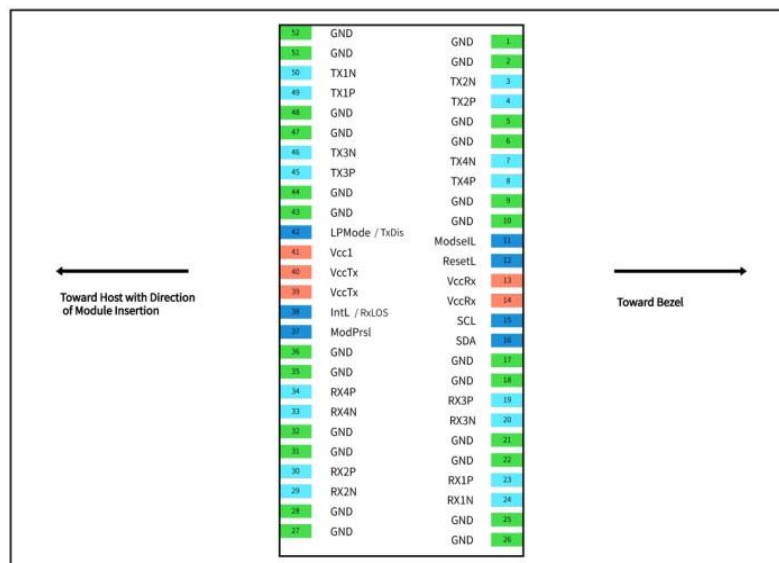
Parameter	Symbol	Min.	Max.	Unit	Notes
Transceiver Case Temperature	DMI_Temp	-3	+3	°C	Over operating temp
Supply Voltage Monitor Absolute Error	DMI_VCC	-3%	+3%	V	Full operating range
Channel RX Power Monitor Absolute Error	DMI_RX	-3	+3	dB	Per channel
Channel Bias Current Monitor	DMI_Ibias	-10%	+10%	mA	Per channel
Channel TX Power Monitor Absolute Error	DMI_TX	-3	+3	dB	Per channel

Pin Assignment

QSFP112 Module contact assignment



QSFP112 Host PCB pad assignment



Pin	Logic	Symbol	Description	Notes
1		GND	Ground	1
2		GND	Ground	1
3	CML-I	Tx2n	Transmitter Inverted Data Input	
4	CML-I	Tx2p	Transmitter Non-Inverted Data Input	
5		GND	Ground	1
6		GND	Ground	1
7	CML-I	Tx4n	Transmitter Inverted Data Input	
8	CML-I	Tx4p	Transmitter Non-Inverted Data Input	
9		GND	Ground	1
10		GND	Ground	1
11	LVTTL-I	ModSelL	Select	
12	LVTTL-I	ResetL	Reset	
13		Vcc Rx	+3.3 V Power supply receiver	2
14		Vcc Rx	+3.3 V Power supply receiver	2
15	LVC MOSI/O	SCL	2-wire serial interface clock	
16	LVC MOSI/O	SDA	2-wire serial interface clock	
17		GND	Ground	1
18		GND	Ground	1
19	CML-O	Rx3p	Receiver Non-Inverted Data Output	
20	CML-O	Rx3n	Receiver Inverted Data Output	
21		GND	Ground	1
22		GND	Ground	1
23	CML-O	Rx1p	Receiver Non-Inverted Data Output	
24	CML-O	Rx1n	Receiver Inverted Data Output	
25		GND	Ground	1
26		GND	Ground	1
27		GND	Ground	1
28		GND	Ground	1
29	CML-O	Rx2n	Receiver Inverted Data Output	
30	CML-O	Rx2p	Receiver Non-Inverted Data Output	
31		GND	Ground	1
32		GND	Ground	1
33	CML-O	Rx4n	Receiver Inverted Data Output	

Pin	Logic	Symbol	Description	Notes
34	CML-O	Rx4p	Receiver Non-Inverted Data Output	
35		GND	Ground	1
36		GND	Ground	1
37	LVTTL-O	ModPrsL	Presen	
38	LVTTL-O	IntL/RxLOS	Interrupt/optional RxLOS	
39		Vcc Tx	+3.3 V Power supply transmitter	2
40		Vcc Tx	+3.3 V Power supply transmitter	2
41		Vcc1	+3.3 V Power Supply	2
42	LVTTL-I	LPMode/Tx Di	Low Power Mode/optional TX Disable	
43		GND	Ground	1
44		GND	Ground	1
45	CML-I	Tx3p	Transmitter Non-Inverted Data Input	
46	CML-I	Tx3n	Transmitter Inverted Data Input	
47		GND	Ground	1
48		GND	Ground	1
49	CML-I	Tx1p	Transmitter Non-Inverted Data Input	
50	CML-I	Tx1n	Transmitter Inverted Data Input	
51		GND	Ground	1
52		GND	Ground	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 above table. Recommended host board power supply filtering is shown in above figure. 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).

Specifications

Absolute Maximum Ratings

Parameter	Symbol	Min.	Max.	Unit	Note
Operating Case Temperature	T _{OP}	0	70	°C	1,2
Power Supply Voltage	V _{CC}	-0.5	3.6	V	
Storage Temperature Range	T _{ST}	-40	85	°C	1,2
Operating Relative Humidity	RH	5	85	%	1,2,3

Notes:

1. Absolute Maximum Ratings are those beyond which damage to the device may occur.
2. Between the Recommended Operating conditions and Absolute Maximum ratings, prolonged operation is not intended, and permanent device degradation may occur.
3. Non-condensing.

Optical Characteristics

Parameter	Symbol	Min.	Typ.	Max.	Unit	Note
Transmitter						
Signaling Rate, each Lane	-	53.125 ± 100 ppm			GBd	
Modulation Format	-	PAM4			-	
Center Wavelength	λ _C	842	-	948	nm	
RMS Spectral Width	-	-	-	0.65	nm	1
Average Launch Power, each Lane	AOP _L	-4.6	-	4	dBm	
Outer Optical Modulation Amplitude (OMA _{outer}), each Lane	T _{OMA}	-	-	3.5	dBm	
Outer Optical Modulation Amplitude (OMA _{outer}), each Lane	T _{OMA}	-2.6	-	-	dBm	
for Max(TECQ, TDECQ) ≤ 1.8 dB		-4.4				
for 1.8 < Max(TECQ, TDECQ) ≤ 4.4 dB						
Transmitter and Dispersion Eye Closure for PAM4 (TDECQ), each Lane	TDECQ	-	-	4.4	dB	
Transmitter Eye Closure for PAM4 (TECQ), each Lane	TECQ	-	-	4.4	dB	
Overshoot/Undershoot	-	-	-	29	%	
Transmitter Power Excursion, each Lane	-	-	-	2.3	dBm	
Extinction Ratio	ER	2.5	-	-	dB	
Transmitter Transition Time, each Lane	-	-	-	17	ps	
Average Launch Power of OFF Transmitter, each Lane	T _{OFF}	-	-	-30	dBm	
RIN _{12OMA}	RIN	-	-	-132	dB/Hz	
Optical Return Loss Tolerance	ORL	-	-	14	dB	
Encircled Flux	-	≥86% at 19 nm ≤30% at 4.5um			-	2
Receiver						
Signaling Rate, each Lane	-	53.125 ± 100 ppm			GBd	
Modulation Format	-	PAM4			-	
Center Wavelength	λ _C	842	-	948	nm	
Damage Threshold	AOP _D	5	-		dBm	3

Parameter	Symbol	Min.	Typ.	Max.	Unit	Note
Average Receive Power, each Lane	AOP _R	-6.3	-	4	dBm	
Receive Power, each Lane (OMAouter)	OMA _R	-	-	3.5	dBm	
Receiver Reflectance	RR	-	-	-15	dB	
Receiver Sensitivity (OMAouter), each Lane for TECQ≤1.8 dB	S _{OMA}	-	-	-	dBm	
for 1.8 < TECQ≤4.4 dB				-4.4		
Stressed Receiver Sensitivity (OMAouter), each Lane	SRS	-	-	-6.2	dBm	4
				-1.8		
Conditions of Stressed Receiver Sensitivity Test						5
Stressed Eye Closure for PAM4 (SECQ)	-	-	4.4	-	dB	
SECQ – 10log10(Ceq), Lane Under Test	-	-	-	4.4	dB	
OMAouter of Each Aggressor Lane	-	-	3.5	-	dBm	

Note:

1. RMS spectral width is the standard deviation of the spectrum.
2. If measured into type A1a.2 or type A1a.3, or A1a.4, 50 μm fiber, in accordance with IEC 61280-1-4.
3. 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.
4. Measured with conformance test signal at TP3 (see 167.8.14) for the BER specified in 167.1.1.
5. These test conditions are for measuring stressed receiver sensitivity. They are not characteristics of the receiver.

Electrical Characteristics

Parameter	Symbol	Min.	Typ.	Max.	Unit	Note
Transmitter						
Signaling Rate, each Lane	-	53.125 ± 50 ppm			GBd	
Differential Pk-Pk Input Voltage Tolerance	-	900	-	-	mV	
Differential to Common-Mode Return Loss	RLcd	802.3ck 120G-2			dB	
Effective Return Loss	ERL	8.5	-	-	dB	
Differential Termination Mismatch	-	-	-	10	%	
Module Stressed Input Tolerance		See 120G.3.4.3			-	
Single-Ended Voltage Tolerance Range	-	-0.4	-	3.3	V	
DC Common-Mode Voltage	-	-350	-	2850	mV	1
Receiver						
Signaling Rate, each Lane	-	53.125 ± 50 ppm			GBd	
AC Common-Mode Output Voltage	-	-	-	17.5	mV	
Differential Peak-to-Peak Output Voltage	-	-	-	-	mV	
Short Mode				600		
Long Mode				900		
Eye Height	EH	15	-	-	mV	
Vertical Eye Closure	VEC	-	-	12	dB	
Common-Mode to Differential Return Loss	RLDc	802.3ck 120G-2			dB	
Effective Return Loss, ERL	ERL	8.5	-	-	dB	

Parameter	Symbol	Min.	Typ.	Max.	Unit	Note
Differential Termination Mismatch	-	-	-	10	%	
Transition Time	-	8.5	-	-	ps	
DC Common-Mode Voltage ¹	Tr/Tf	-350	-	2850	mV	2
Power Supply						3
Power Supply Voltage	V _{CC1} , V _{CCTx} , V _{CCRx}	3.13	3.30	3.47	V	
Power Consumption	PW	-	-	10	W	
Power Consumption-LP mode	-	-	-	1.5	W	

Notes:

1. DC common-mode voltage generated by the host. Specification includes effects of ground offset voltage.
2. The signaling rate range is derived from the PMD receiver input. DC common-mode voltage is generated by the host. Specification includes effects of ground offset voltage.
3. The specified characteristics are met within the recommended range of operation. Unless otherwise noted typical data are quoted at nominal voltage and +25°C ambient temperature.

Ordering Information

Product Name	Product Description
Q112-400G-VR4-05	400G QSFP112 VR4 850nm 50m on OM4, MTP/MPO-12 Optical Transceiver Module

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