QSFP112 400GBASE-SR4 850nm 50m Transceiver

QSFP112-SR4-400G



Application

- 400GBASE-SR4 Ethernet
- InfiniBand NDR
- Switch & Router Connections
- Data Centers
- Other 400G Interconnect Requirements

Features

- Data rate 106.25Gbps (PAM4) per channel
- 4x100G PAM4 VCSEL array
- MPO-12 APC connector
- Single +3.3V power supply
- DDM function implemented
- Hot-pluggable QSFP112 form factor
- Maximum link length of 50m on OM4(MMF)
- Operating temperature range: 0~+70° C
- Maximum power consumption 9W
- Class 1 laser

Description

The 400G QSFP112 SR4 Transceiver is designed to transmit and receive serial optical data links up to 106.25 Gb/s data rate (per channel) by PAM4 modulation format over multi-mode fiber. It is a small-form- factor hot pluggable transceiver module integrated Optical Extinction Ratio 2.5 dB with high performance vcsel. It is compliant with 400G Ethernet specs and QSFP112 MSA.

I. Specification

Parameter	Symbol	Unit	Min.	Typ.	Max.	Notes
Transmitter (Per Lane)						
Signaling Speed Per Lane		GBd		53.125±100pm		
Modulation Format				PAM4		
Center Wavelength		nm	844	850	860	
RMS Spectral Width	RMS	dB			0.6	
Average Launch Power Per Lane	TXPx	dBm	-4.6		4	
Outer Optical Modulation Amplitude Per Lane	OMAouter	dBm	-2.6		3.5	
Transmitter Excursion, Each Lane	DPx	dB			2.3	
Transmitter and Dispersion Penalty Eye Closure for PAM4, Each Lane	TDECQ	dB			4.4	
Average Launch Power of Off Transmitter, Each Lane		dBm			-30	
Transmitter Transition Time	Tr、Tf	ps			17	
Optical Extinction Ratio	ER	dB	2.5			
$RIN_{12}OMA$		dB/Hz			-132	
Optical Return Loss Tolerance		dB			12	
Encircled Flux						≥86% at 19mm, ≤30% at 4.5 mm

Parameter	Symbol	Unit	Min.	Typ.	Max.	Notes
Receiver (Per Lane)						
Signaling Speed Per Lane		GBd		53.125±100pm		
Modulation Format				PAM4		
Input Operating Wavelength		nm	842		948	
Damage Threshold Per Lane	DT	dBm	5			
Average Receive Power Per Lane	RXPx	dBm	-6.4		4	
Receive Power OMAouter **Per Lane**	OMAouter	dBm			3.5	
Receiver Reflectance	Rfl	dB			-12	
Receiver Sensitivity (OMAouter)**, Each Lane**		dBm			-4.6	
Stressed Sensitivity (OMAouter)	S	dBm			-2	BER=2.4E-4 TDECQ=4.4

II. Ordering Information

Part No.	Specifications									Application
	Package	Data rate	Laser	Optical Power	Detector	Sensitivity	Temp	Reach	Others	
QSFP112-SR4	QSFP112	400G	VCSEL	-4.6~4dBm	PIN	< -4.6dBm@OMA	0~70 °C	50M	RoHS	400G Base SR4

III. Absolute Maximum Ratings

Parameter	Symbol	Unit	Min	Max
Storage Temperature Range	Ts	℃	-40	+85
Relative Humidity	RH	%	5	95
Power Supply Voltage	Vcc	V	-0.5	+4.0

IV. Recommended Operating Conditions

Parameter	Symbol	Unit	Min	Typ	Max
Operating Case Temperature Range	Tc	°C	0	/	70
Power Supply Voltage	Vcc	V	3.135	3.3	3.465

Optical Interface

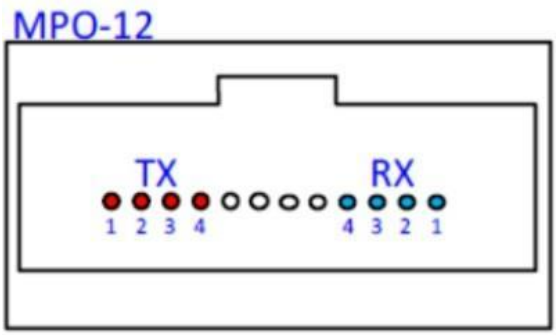


Figure 1 Optical Lane Sequence

Principle Diagram

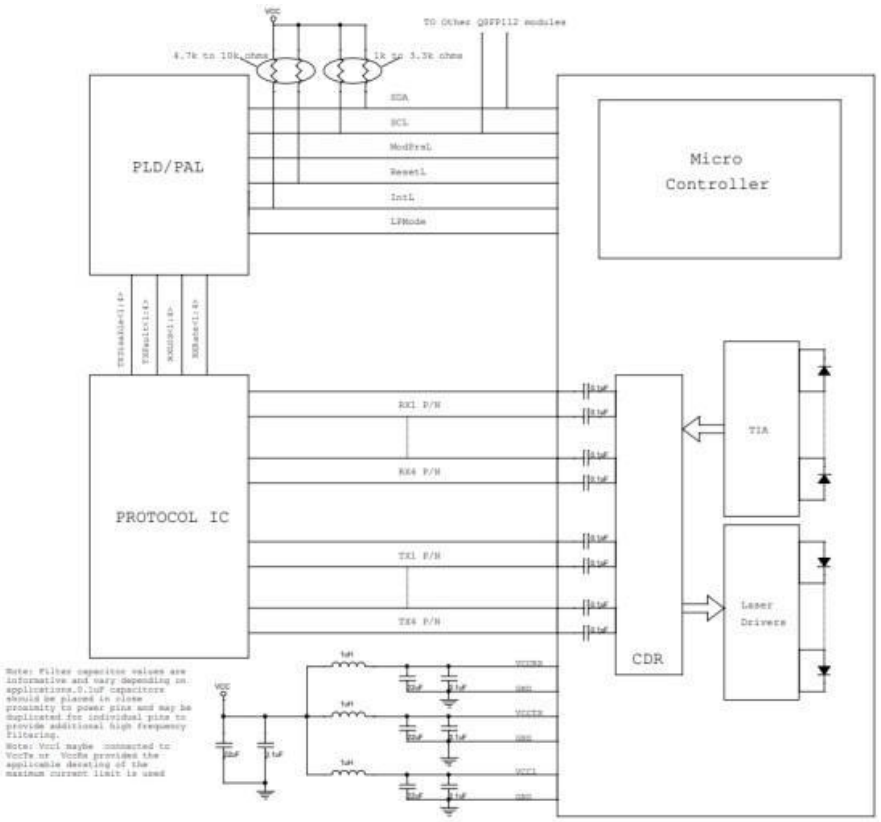


Figure 2 Module Principle Diagram

V. Electric Ports Definition

Parameter	Symbol	Unit	Min	Typ	Max	Notes
Supply Voltage	V_{CC}	V	3.14		3.47	
Supply Current	I_{CC}	mA			3000	
Transceiver Power-on Initialize Time		ms			2000	
Transmitter						
PAM4 Signaling Rate Per Lane	BR	GBd		53.125		PAM4
Single Ended Input Voltage Tolerance	VinT	V	-0.3		4.0	
Differential Data Input Swing	VIN	mVp-p			880	
Common Mode Noise (RMS)		mV			17.5	
Differential Differential Termination Resistance Mismatch		%			10	
Receiver						
PAM4 Signaling Rate Per Lane		GBd		53.125		
Single Ended Output Voltage	VoutR	V			0.45	
Differential Data Output Swing	Vout,PP	mVp-p			900	
Common Mode Noise (RMS)		mV			17.5	
Differential Differential Termination Resistance Mismatch		%			10	
IIC communication						
IIC Clock Frequency (Fast Mode)	-	MHZ	/	/	1	
Clock Stretching	-	us	/	/	500	
Data Hold Time	-	ns	300	/	/	

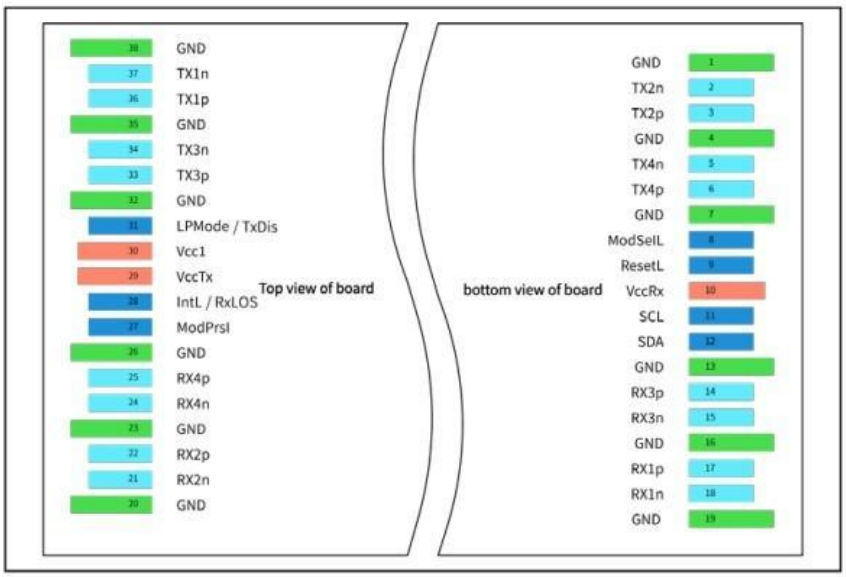


Figure 3 Electrical Pin-out Details

VI. Pin Descriptions

Pin No.	Logic	Symbol	Description	Note
1		GND	Ground	1
2	CML-I	Tx2n	Transmitter Inverted Data Input	
3	CML-I	Tx2p	Transmitter Non-Inverted Data output	
4		GND	Ground	1
5	CML-I	Tx4n	Transmitter Inverted Data Input	
6	CML-I	Tx4p	Transmitter Non-Inverted Data output	
7		GND	Ground	1
8	LVTTL-I	ModSelL	Select	
9	LVTTL-I	ResetL	Reset	
10		VccRx	+3.3V Power Supply Receiver	2
11	LVCOMS-I/O	SCL	2-Wire Serial Interface Clock	

Pin No.	Logic	Symbol	Description	Note
12	LVCOMS-I/O	SDA	2-Wire Serial Interface Data	
13		GND	Ground	1
14	CML-0	Rx3p	Receiver Non-Inverted Data Output	
15	CML-0	Rx3n	Receiver Inverted Data Output	
16		GND	Ground	1
17	CML-0	Rx1p	Receiver Non-Inverted Data Output	
18	CML-0	Rx1n	Receiver Inverted Data Output	
19		GND	Ground	1
20		GND	Ground	1
21	CML-0	Rx2n	Receiver Inverted Data Output	
22	CML-0	Rx2p	Receiver Non-Inverted Data Output	
23		GND	Ground	1
24	CML-0	Rx4n	Receiver Inverted Data Output	
25	CML-0	Rx4p	Receiver Non-Inverted Data Output	
26		GND	Ground	1
27	LVTTL-0	ModPrsL	Present	
28	LVTTL-0	IntL/RxLOS	Interrupt/optional RxLOS	
29		VccTx	+3.3 V Power Supply transmitter	2
30		Vcc1	+3.3 V Power Supply	2
31	LVTTL-I	LPMode/TxDis	Low Power Mode/optional TX Disable	
32		GND	Ground	1

Pin No.	Logic	Symbol	Description	Ref.
33	CML-I	Tx3p	Transmitter Inverted Data Input	
34	CML-I	Tx3n	Transmitter Non-Inverted Data output	
35		GND	Ground	1
36	CML-I	Tx1p	Transmitter Inverted Data Input	
37	CML-I	Tx1n	Transmitter Non-Inverted Data output	
38		GND	Ground	1
39		GND	Ground	1
40	CML-I	Tx6n	Transmitter Inverted Data Input	
41	CML-I	Tx6p	Transmitter Non-Inverted Data output	
42		GND	Ground	1
43	CML-I	Tx8n	Transmitter Inverted Data Input	
44	CML-I	Tx8p	Transmitter Non-Inverted Data output	
45		GND	Ground	1
46		Reserved	For future use	3
47		VS1	Module Vendor Specific 1	3
48		VccRx1	+3.3V Power Supply Receiver	2
49		VS2	Module Vendor Specific 2	3
50		VS3	Module Vendor Specific 3	3
51		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 Table 4. Recommended host board power supply filtering is shown in Figure 4. Vcc Rx, Vcc1and 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).

VII. Module Memory Map

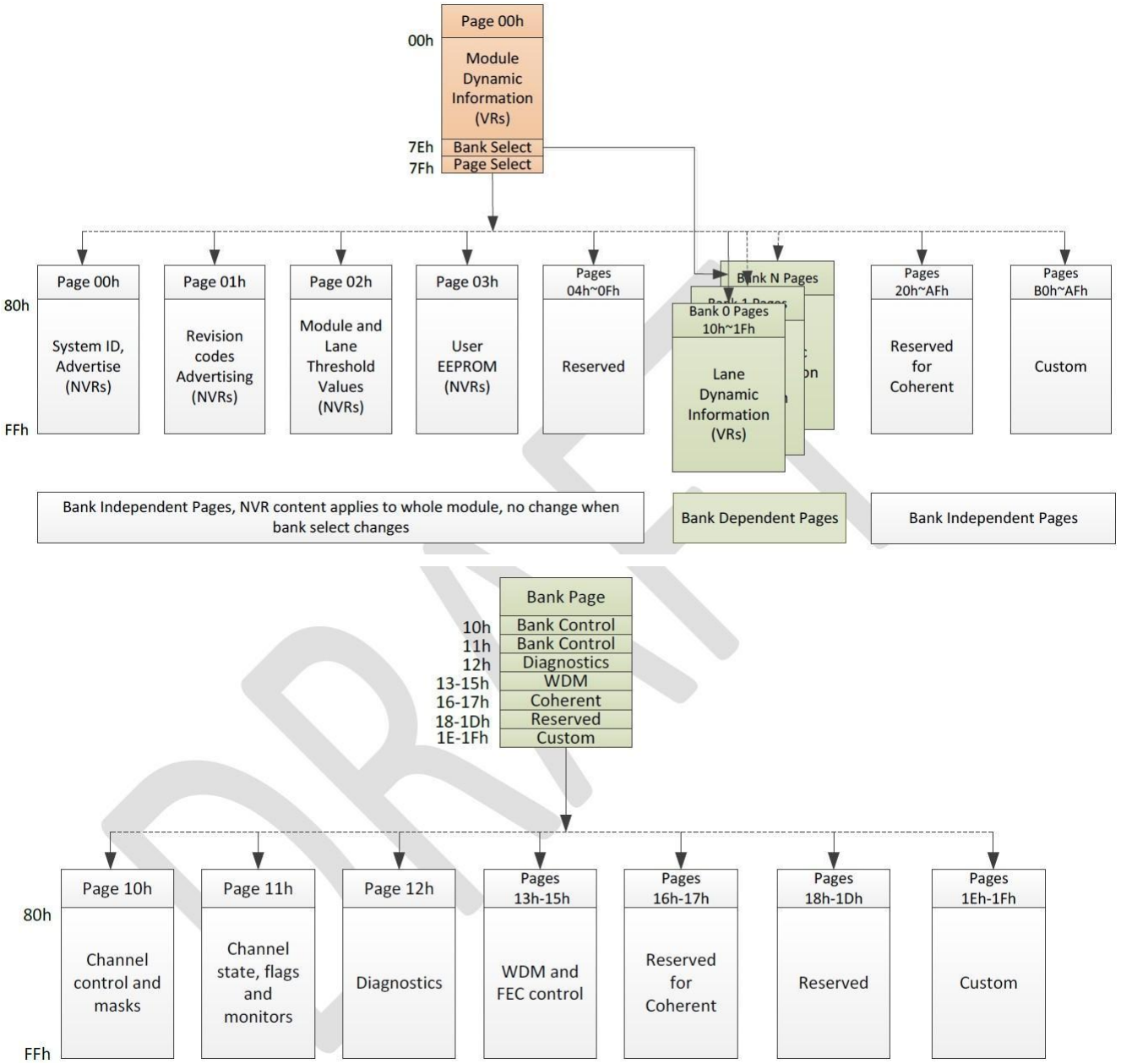


Figure 4 Digital Diagnostic Memory Map

VIII. Host Board Power Supply Filtering

Any voltage drop across a filter network on the host is counted against the host DC set point accuracy specification. Inductors with DC Resistance of less than 0.1 Ohm should be used in order to maintain the required voltage at the Host Edge Card Connector. Figure5 is the suggested transceiver/host interface.

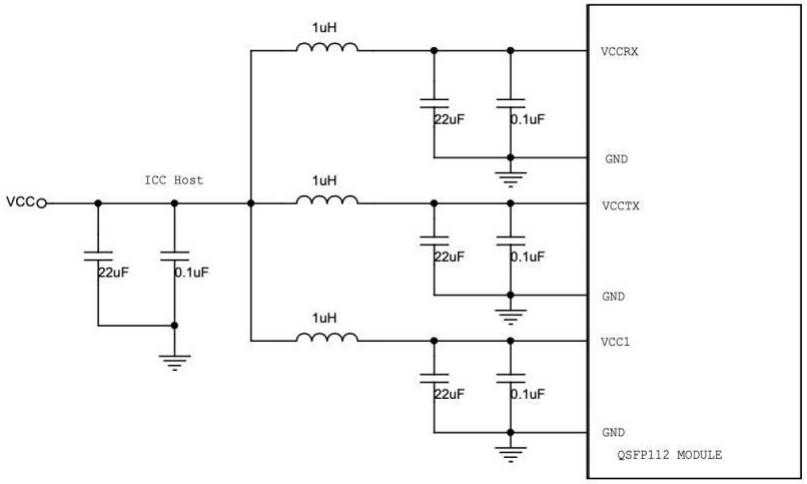
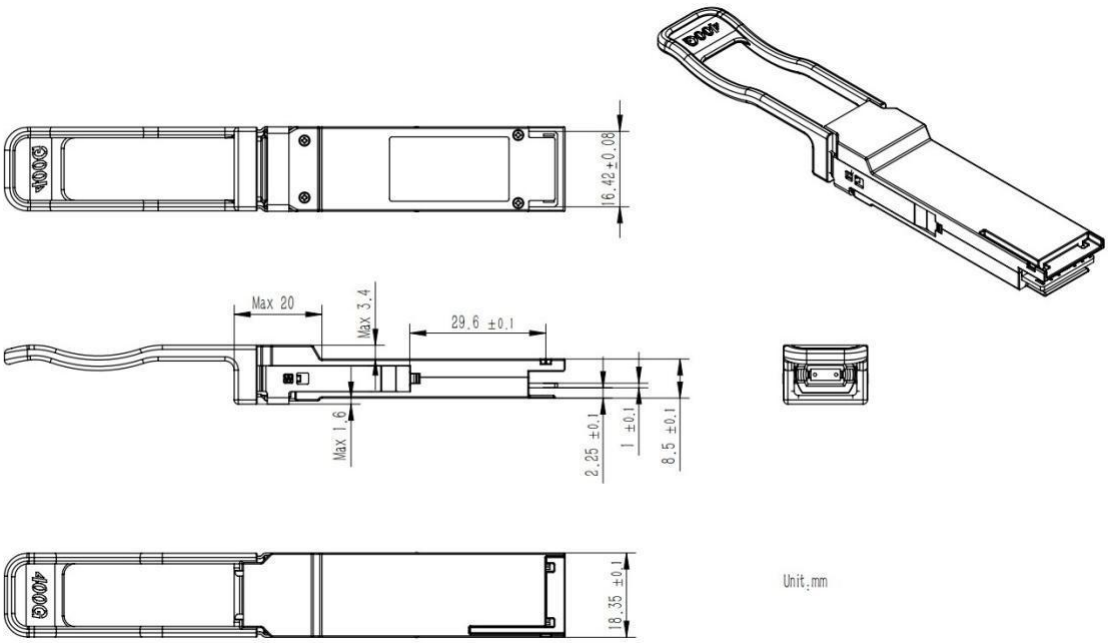


Figure 5 Recommended Host Board Power Supply Filtering

IX. Package Outline



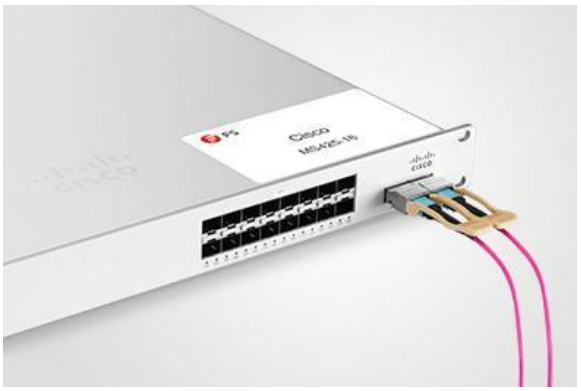
Test Center

I. Compatibility Testing

Each fiber optical transceiver has been tested in host device on site in FS Assured Program to ensure full compatibility with over 200 vendors.



Cisco Catalyst C9500-24Y4C



Cisco MS425-16



Brocade VDX 6940-144S



Dell EMC Networking Z9100-ON



Force⑩tm S60-44T

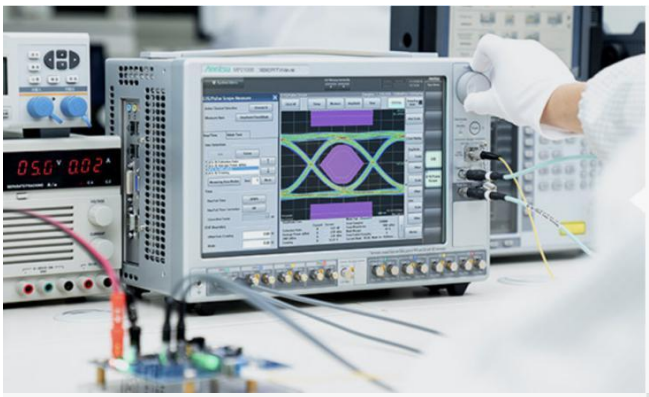


HUAWEI S6720-30L-HI-24S

Above is part of our test bed network equipment. For more information, please click the Test Bed PDF. It will be updated in real time as we expand our portfolio.

II. Performance Testing

Each fiber optical transceiver has been fully tested in FS Assured Program equipped with world's most advanced analytical equipment to ensure that our transceivers work perfectly on your device.



1. TX/RX Signal Quality Testing

Equipped with the all-in-one tester integrated 4ch BERT & sampling oscilloscope, and variable optical attenuator to ensure the input and output signal quality.

- Eye Pattern Measurements: Jitter, Mask Margin, etc
- Average Output Power
- OMA
- Extinction Ratio
- Receiver Sensitivity
- BER Curve

2. Reliability and Stability Testing

Subject the transceivers to dramatic changes in temperature on the thermal shock chamber to ensure reliability and stability of the transceivers.

- Commercial: 0 °C to 70 °C
- Extended: -5 °C to 85 °C
- Industrial: -40 °C to 85 °C





3. Transfer Rate and Protocol Testing

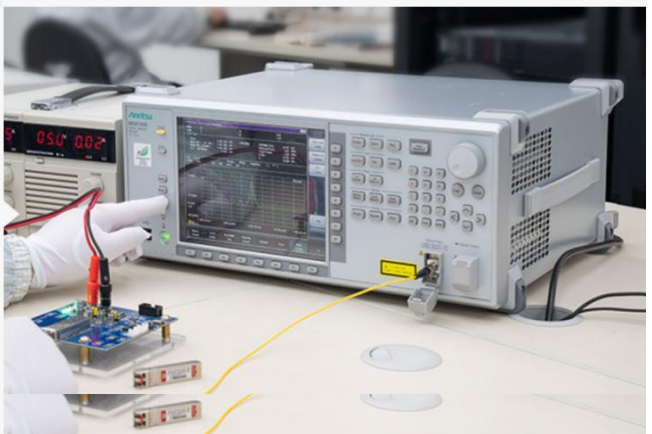
Test the actual transfer data rate and the transmission ability under different protocols with Network Master Pro.

- Ethernet
- Fibre Channel
- SDH/SONET
- CPRI

4. Optical Spectrum Evaluation

Evaluate various important parameters with the Optical Spectrum Analyzer to meet the industry standards.

- Center Wavelength, Level
- OSNR
- SMSR
- Spectrum Width



Order Information

Part Number	Description
QSFP112-FR4-400G	400GBASE-FR4 QSFP112 PAM4 1310nm 2km Transceiver
QSFP112-SR4-400G	400GBASE-SR4 QSFP112 PAM4 850nm 50m Transceiver
QSFP112-DR4-400G	400GBASE-DR4 QSFP112 PAM4 1310nm 500m Transceiver
QSFP112-LR4-400G	400GBASE-LR4 QSFP112 PAM4 1310nm 10km Transceiver
QSFP112-XDR4-400G	400GBASE-XDR4 QSFP112 PAM4 1310nm 2km Transceiver