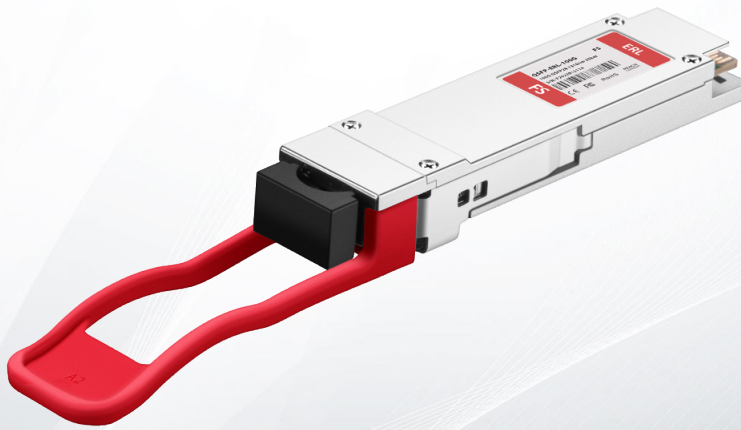


100GBASE-ERL QSFP28 Single Lambda 1310nm 25km DOM Transceiver

QSFP-ERL-100G



Application

- 100GBASE-ER

Standards

- CEI-28G-VSR
- 100G QSFP28 Lambda MSA ER1-30 Rev 1.1
- SFF-8636

Features

- Up to 106.25Gbps Data Rate Single Channel
- 1x106.25Gbps PAM4 Line Side, 4x25.78Gbps NRZ Host Side or 4x26.56Gbps NRZ Host Side (Close Media-side KP1 FEC inside Module) 1331nm) DFB LD
- 100Gbps Hermetic TOSA with 1310nm EML and APD Detector
- Dual LC Optical Interface Compliant
- DDM Function Implemented
- Maximum Link Length of 25km on SMF Fiber
- Low Power Dissipation: <4W
- International Class 1 Laser Safety Certified
- Operating Temperature Range: 0°C ~ +70 °C

Description

The 100GBASE-ERL QSFP28 Optical Transceiver Module is designed for use in 100GBASE Ethernet throughput up to 25km over single mode fiber (SMF) using a wavelength of 1310nm via duplex LC connectors. This transceiver is compliant with IEEE 802.3ba 100GBASE-ERL Lite standard. With these features, this easy to install, hot swappable transceiver is suitable to be used in various applications, such as 100G telecom connections, data centers, high-performance computing networks,enterprise core and distribution layer applications.

Product Specifications

I. Absolute Maximum Ratings

Parameter	Symbol	Min.	Max.	Unit
Storage Temperature Range	T _s	-40	85	°C
Power Supply Voltage	V _{CC}	-0.5	3.6	V
Relative Humidity	RH	5	85	%
Operating Case Temperature Range	T _C	0	70	°C
Receiver Damage Threshold Per Lane	P _{dag}	-2.4		dBm

II. Recommended Operating Conditions

Parameter	Min.	Typical	Max.	Unit
Supply Voltage	3.135	3.3	3.465	V
Operating Case Temperature	0		70	°C
Data Rate(Electrical)	25.78125*4	26.5625*4		Gbps
Data Rate(Optical)		106.25		Gbps
Link Distance with G.652			25	km

III. Optical Characteristics

Parameter	Min.	Typ.	Max.	Unit	Ref.
Transmitter					
Transmitter Rate		53.125+/-100ppm		GBd	PAM4
Lane Center WL	1304.5		1317.5	nm	
Side-mode Suppession Ratio	30			dB	
Optical Output Power	0		5.6	dBm	
Optical Modulation Amplitude	3.0		6.4	dBm	For TDECQ<1.4dB
	1.6+TDE CQ		6.4	dBm	For 1.4dB<TDECQ<TEDCQ(max)
Transmitter and Dispersion Penalty Eye Closure for PAM4 (TDECQ)			3.9	dB	
TECQ			3.9	dB	
TDECQ-TECQ			2.7	dB	
Extinction Ratio	5			dB	
Average Launch Power of OFF Transmitter			-15	dB	
Transmitter Over/Under-shoot			22	%	
Optical Return Loss Tolerance			15	dB	
Transmitter Reflectance			-26	dB	
Transmitter Transition Time			17	ps	
RINx OMA (max) Where x is The Optical Return Loss Tolerance (Max)			-1: 36	dB/Hz	

Parameter	Min.	Typ.	Max.	Unit	Ref.
Receiver					
Receive Rate		53.125+/-100ppm		GBd	PAM4
Average Receive Power	-13.5		-2.6	dBm	
Lane Center WL	1304.5		1317.5	nm	
Damage Threshold	-2.4			dBm	
Receiver Power(OMA_{outer})			-2.6	dBm	
Receive Sensitivity(OMA_{outer})			-10.5	dBm	BER@2.4E-4
Stressed Sensitivity (OMA_{outer})			-8	dBm	
Receiver Reflectance			-26	dB	
Conditions of Stressed Receiver Sensitivity Test					
Stressed Eye Closure for PAM4(Test Conditions)		3.9		dB	SECQ

IV. Electrical Characteristics

Parameter	Min.	Typ.	Max.	Unit	Ref.
Transmitter					
Differential Data Input Swing			900	mV	
Differential Impedance		100		Q	
Differential Termination Mismatch		10		%	
Receiver					
Differential Data Input Swing			900	mV	
Eye Height, Differential Output	228			mV	
Eye Width,Output	0.57			UI	
Differential Impedance			100	Q	
Differential Termination Mismatch			10	%	

V. Digital Diagnostic Monitor Functions

The common memory map is compliant to SFF-8636 Rev 2.10. SFF-8636 defines a common management interface for 4-lane pluggable transceiver modules, direct attach modules and shielded cable assemblies. It sets the EEPROM memory space as follows:

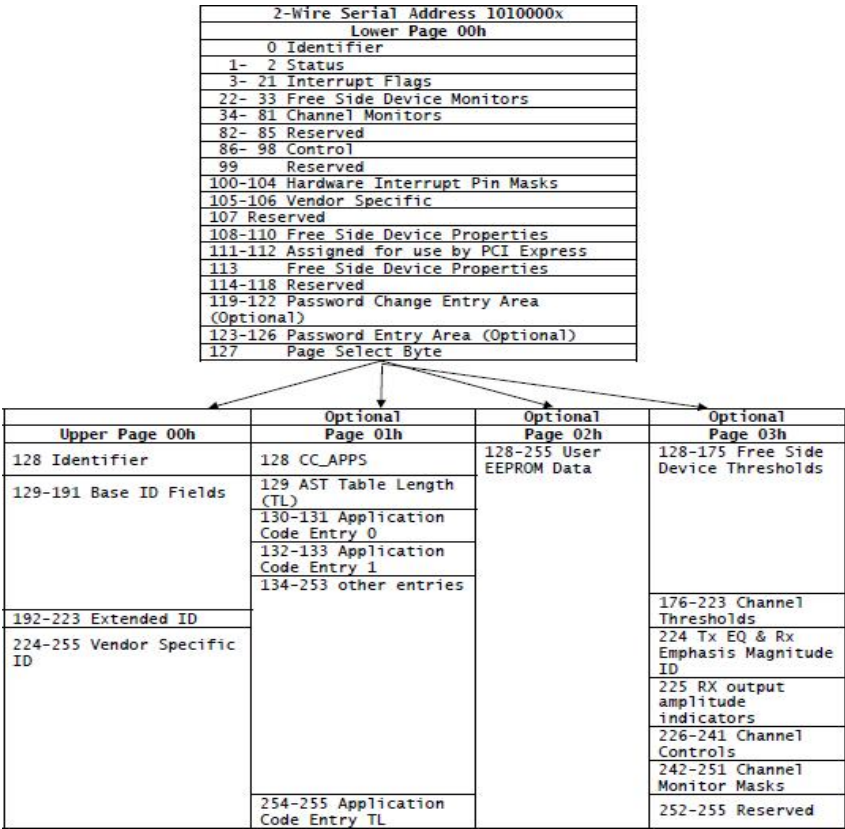


Figure 1: Two-Wire Interface Fields

VI. Digital Diagnostic Monitor Characteristics

Parameter	Accuracy	Unit	Notes
Transceiver Case Temperature	± 3	C	Over operating temp
Supply Voltage	± 3%	V	Full operating range
Bias Current	± 10%	mA	Per channel
RX Power	± 3	dB	Range from the LOS assert power to the overload power The value of Rx DDM=-40 dBm ,when there is no power input
TX Power	± 3	dB	The value of Tx DDM=-40dBm, when tx-disable is asserted

VII. Pin Function Definitions

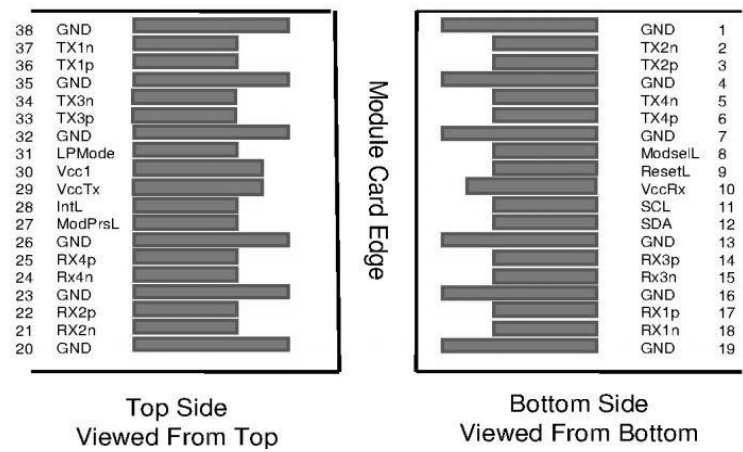


Figure 2: QSFP Compliant 38-Pin Connector

VIII. Transceiver Pin Descriptions

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

Pin No.	Symbol	Description	Ref.
12	SDA	2-wire serial interface data	
13	GND	Ground	1
14	Rx3p	Receiver Non-Inverted Data Output	
15	Rx3n	Receiver Inverted Data Output	
16	GND	Ground	1
17	Rx1p	Receiver Non-Inverted Data Output	
18	Rx1n	Receiver Inverted Data Output	
19	GND	Ground	1
20	GND	Ground	1
21	Rx2n	Receiver Inverted Data Output	
22	Rx2p	Receiver Non-Inverted Data Output	
23	GND	Ground	1
24	Rx4n	Receiver Inverted Data Output	
25	Rx4p	Receiver Non-Inverted Data Output	
26	GND	Ground	1
27	ModPrsL	Module Present	
28	ntL	Interrupt	
29	VccTx	+3.3 V Power supply transmitter	2
30	Vcc1	+3.3 V Power Supply	2
31	L PMode	Low Power Mode	
32	GND	Ground	1

Pin No.	Symbol	Description	Ref.
33	Tx3p	Transmitter Non-Inverted Data Input	
34	Tx3n	Transmitter Inverted Data Input	
35	GND	Ground	1
36	Tx1p	Transmitter Non-Inverted Data Input	
37	Tx1n	Transmitter Inverted Data Input	
38	GND	Ground	1

- Notes:
- 1. GND is the symbol for signal and supply (power) common for the QSFP28 module. All are common within the module and all module voltages are referenced to this potential unless otherwise noted. Connect these directly to the host board signal common ground plane.
 - 2. VccRx, Vcc1 and VccTx are the receiving and transmission power suppliers and shall be applied concurrently. Recommended host board power supply filtering is shown in Figure 3 below. Vcc Rx, Vcc1 and VccTx may be internally connected within the module in any combination. The connector pins are each rated for a maximum current of 1000mA.

IX. Mechanical Dimensions

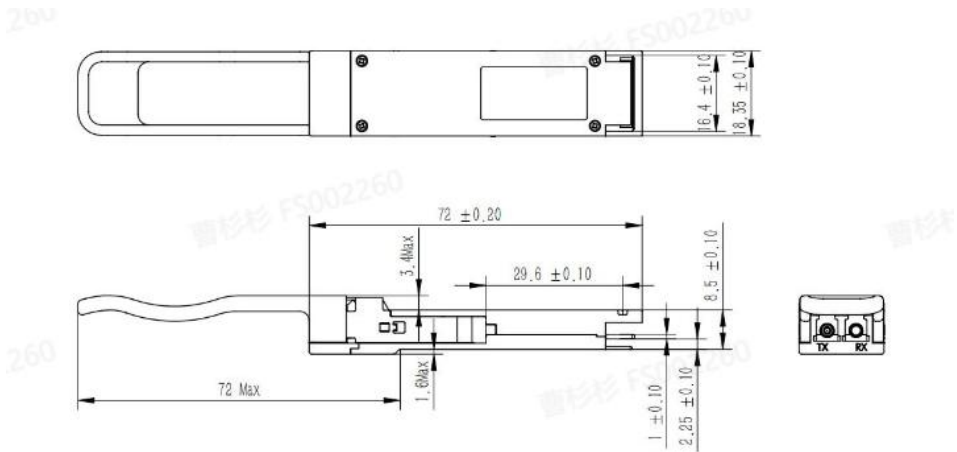


Figure 3: Mechanical dimensions

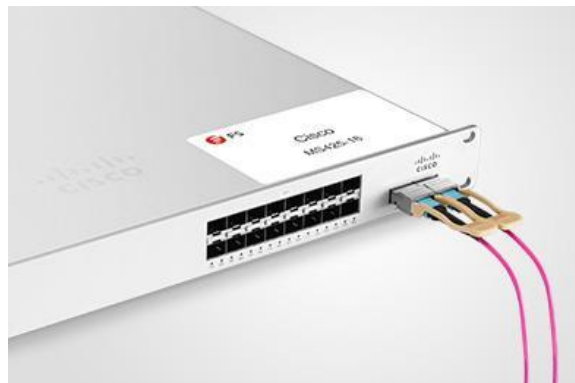
Test Center

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



Force@tm S60-44T

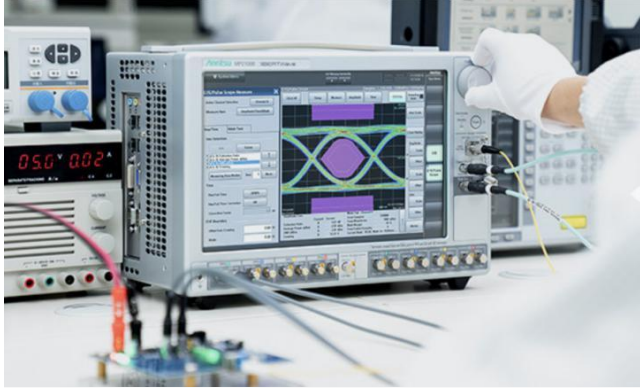


HUAWEI S6720-30L-HI-24S

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.

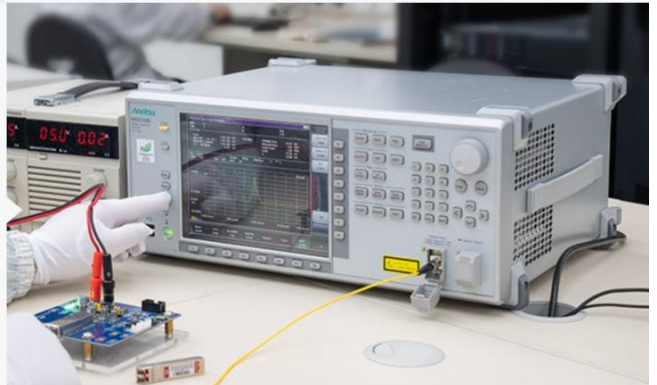
- Ethernet
- Fibre Channel
- SDH/SONET
- CPRI



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
QSFP-100G-DR-S	QSFP28 100GBASE-DR Single Lambda 1310nm 500m Transceiver
QSFP-FR-100G-27	QSFP28 100GBASE-FR Single Lambda 1270nm 2km Transceiver
QSFP-FR-100G-29	QSFP28 100GBASE-FR Single Lambda 1290nm 2km Transceiver
QSFP-FR-100G-33	QSFP28 100GBASE-FR Single Lambda 1330nm 2km Transceiver
QSFP-100G-FR-S	QSFP28 100GBASE-FR Single Lambda 1310nm 2km Transceiver
QSFP-LR-100G-33	QSFP28 100GBASE-LR Single Lambda 1270nm 10km Transceiver
QSFP-100G-LR-S	QSFP28 100GBASE-LR Single Lambda 1290nm 10km Transceiver
QSFP-100G-ERL-S	QSFP28 100GBASE-ERL Single Lambda 1310nm 25km Transceiver
QSFP-ER-100G	QSFP28 100GBASE-ER Single Lambda 1310nm 30km Transceiver