

# 16G Fiber Channel SFP+ 850nm 100m DOM Transceiver Module

SFP-16GSR-85



## Application

- 4.25/8.5/14.025G Fibre channel

## Features

- Supports up to 14.025Gbps bit rates
- Hot-pluggable SFP+ footprint
- 850nm VCSEL laser and PIN photodiode, Up to 100m for OM3-MMF transmission
- Single +3.3V power supply
- Real Time Digital Diagnostic Monitoring
- Operating case temperature: Standard: 0 to +70° C
- Compliant with SFP+ MSA and SFF-8472 with duplex LC receptacle
- Compatible with RoHS

## Description

The SFP+ transceivers are high performance, cost effective modules supporting data rate of 14.025 Gbps.

Fiber type	Data rate (Gbps)	Operating range (meters)
OM2	4.25	0.5~150
	8.5	0.5~50
	14.025	0.5~35
OM3	4.25	0.5~380
	8.5	0.5~150
	14.025	0.5~100

The transceiver consists of three sections: a VCSEL laser transmitter, a PIN photodiode integrated with a trans-impedance preamplifier (TIA) and MCU control unit. All modules satisfy class I laser safety requirements.

The transceivers are compatible with SFP Multi-Source Agreement and SFF-8472 digital diagnostics functions.

## Product Specifications

### I. Absolute Maximum Ratings

Parameter	Symbol	Min	Typ.	Max	Unit	Ref.
Supply Voltage	V <sub>cc</sub>	-0.5		4.5	V	
Storage Temperature	T <sub>s</sub>	-40		+85	°C	
Operating Humidity		5		85	%	

### II. Recommended Operating Environment

Parameter	Symbol	Min	Typ.	Max	Unit	Ref.
Operating Case Temperature	T <sub>c</sub>	0		+70	°C	
Power Supply Voltage	V <sub>cc</sub>	3.135	3.30	3.465	V	

**Power Supply Current**  $I_{CC}$  300 mA

**Data Rate** 14.025 Gbps

### III. Optical and Electrical Characteristics

Parameter	Symbol	Min	Typ.	Max	Unit	Ref.
<b>Transmitter</b>						
<b>Centre Wavelength</b>	$\lambda_c$	840	850	860	nm	
<b>Spectral Width (RMS)</b>	$\Delta\lambda$			0.59	nm	
<b>Side-Mode Suppression Ratio</b>	SMSR				dB	
<b>Average Output Power</b>	$P_{out}$	-7.8		-0.5	dBm	1
<b>Extinction Ratio</b>	ER	3.0			dB	
<b>Data Input Swing Differential</b>	$V_{IN}$	180		950	mV	2
<b>Input Differential Impedance</b>	$Z_{IN}$	90	100	110	$\Omega$	
<b>TX Disable</b>	<b>Disable</b>	2.0		$V_{CC}$	V	
	<b>Enable</b>	0		0.8	V	
<b>TX Fault</b>	<b>Fault</b>	2.0		$V_{CC}$	V	
	<b>Normal</b>	0		0.8	V	
<b>Receiver</b>						
<b>Centre Wavelength</b>	$\lambda_c$	840	850	860	nm	
<b>Receiver Sensitivity</b>				-10.5	dBm	3
<b>Receiver Overload</b>		0			dBm	3
<b>LOS De-Assert</b>	$LOS_D$			-12	dBm	

<b>LOS Assert</b>	LOS <sub>A</sub>	-22			dBm	
<b>LOS Hysteresis</b>		0.5		4	dB	
<b>Data Output Swing Differential</b>	V <sub>out</sub>	500	700	900	mV	4
<b>LOS</b>	High	2.0		V <sub>cc</sub>	V	
	Low			0.8	V	

**Notes:**

- 1.The optical power is launched into MMF.
- 2.PECL input, internally AC-coupled and terminated.
- 3.Measured with a PRBS 2<sup>31</sup>-1 test pattern @14025Mbps, BER ≤ 1 × 10<sup>-12</sup>.
- 4.Internally AC-coupled.

### III. Timing and Electrical

Parameter	Symbol	Min	Typ.	Max	Unit	Ref.
<b>Tx Disable Negate Time</b>	t <sub>on</sub>			1	ms	
<b>Tx Disable Assert Time</b>	t <sub>off</sub>			10	μs	
<b>Time To Initialize, including Reset of Tx Fault</b>	t <sub>init</sub>			300	ms	
<b>Tx Fault Assert Time</b>	t <sub>fault</sub>			100	μs	
<b>Tx Disable To Reset</b>	t <sub>reset</sub>	10			μs	
<b>LOS Assert Time</b>	t <sub>loss_on</sub>			100	μs	
<b>LOS De-assert Time</b>	t <sub>loss_off</sub>			100	μs	
<b>Serial ID Clock Rate</b>	f <sub>serial_clock</sub>		100	400	KHz	
<b>MOD_DEF (0:2)-High</b>	V <sub>H</sub>	2		V <sub>cc</sub>	V	
<b>MOD_DEF (0:2)-Low</b>	V <sub>L</sub>			0.8	V	

### IV. Digital Diagnostic Monitoring Information

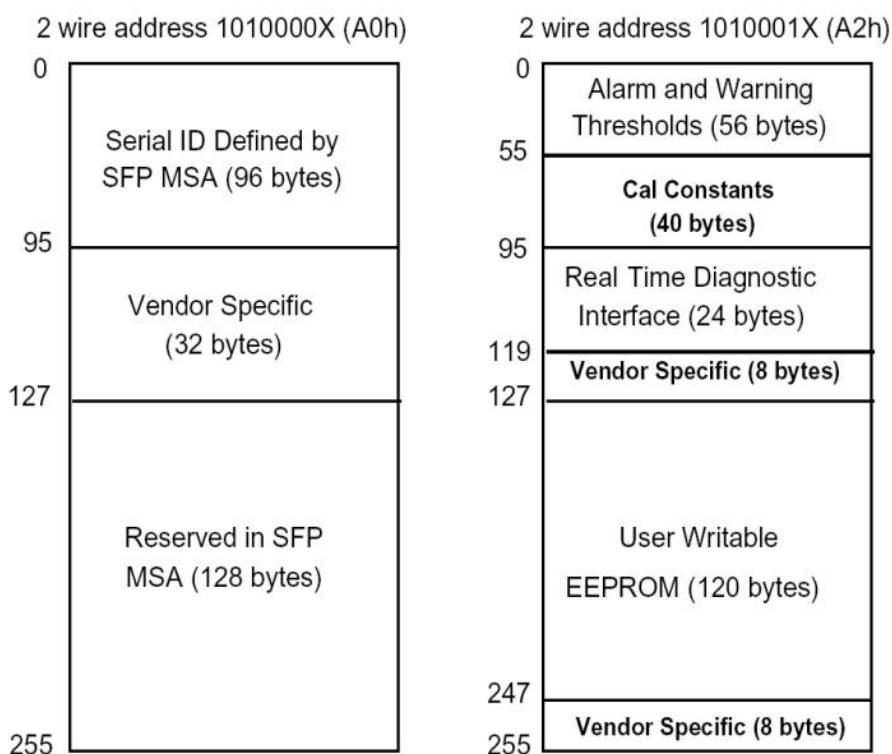
Parameter	Range	Unit	Accuracy	Calibration
<b>Temperature</b>	0 to +70	° C	± 3°C	Internal
<b>Voltage</b>	3.0 to 3.6	V	± 3%	Internal
<b>Bias Current</b>	0 to 15	mA	± 10%	Internal
<b>TX Power</b>	-7.8 to -0.5	dBm	± 3dB	Internal
<b>RX Power</b>	-16 to -1	dBm	± 3dB	Internal

### V. Digital Diagnostic Memory Map

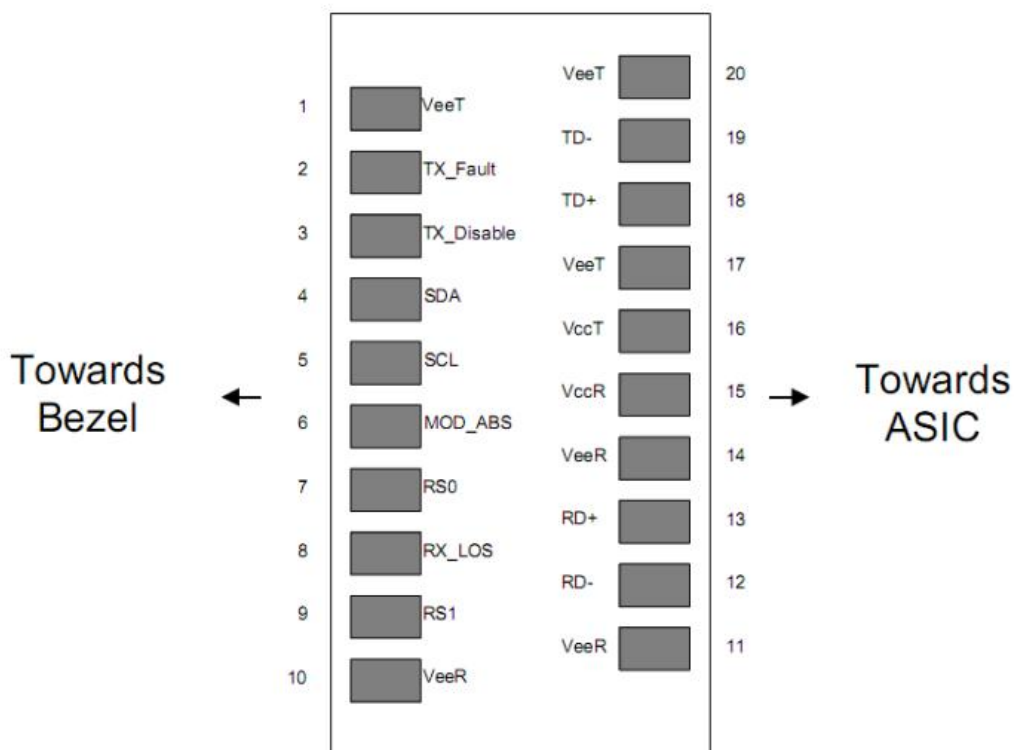
The transceivers provide serial ID memory contents and diagnostic information about the present operating conditions by the 2-wire serial interface (SCL, SDA).

The diagnostic information with internal calibration or external calibration all are implemented, including received power monitoring, transmitted power monitoring, bias current monitoring, supply voltage monitoring and temperature monitoring.

The digital diagnostic memory map specific data field defines as following.



## VI. Pin Assignment



Pin	Logic	Description	Plug Seq.	Notes
1	V <sub>EET</sub>	Transmitter Ground	1	
2	TX FAULT	Transmitter Fault Indication	3	1
3	TX DISABLE	Transmitter Disable	3	2
4	SDA	SDA Serial Data Signal	3	
5	SCL	SCL Serial Clock Signal	3	
6	MOD_ABS	Module Absent. Grounded within the module	3	
7	RS0	Not Connected	3	
8	LOS	Loss of Signal	3	3
9	RS1	Not Connected	3	
10	V <sub>EER</sub>	Receiver ground	1	
11	V <sub>EER</sub>	Receiver ground	1	
12	RD-	Inv. Received Data Out	3	4

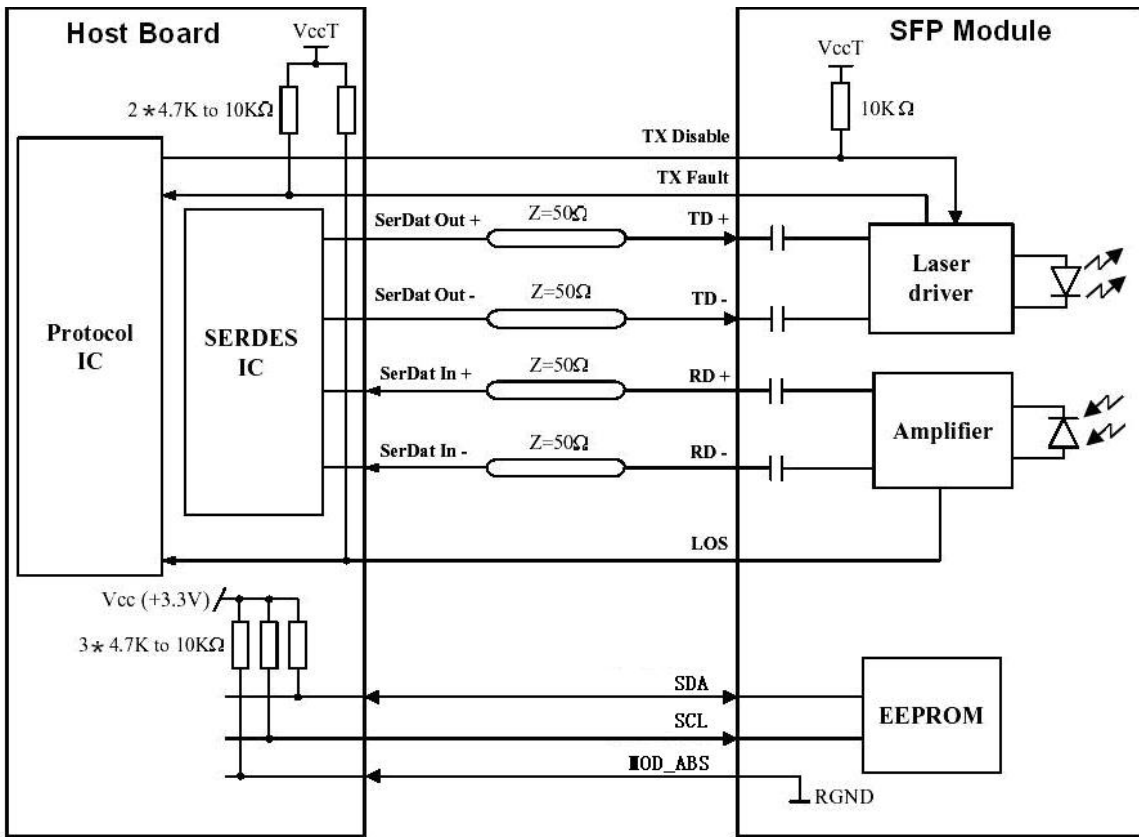
13	RD+	Received Data Out	3	4
14	V <sub>EER</sub>	Receiver ground	1	
15	V <sub>CCR</sub>	Receiver Power Supply	2	
16	V <sub>CCT</sub>	Transmitter Power Supply	2	
17	V <sub>EET</sub>	Transmitter Ground	1	
18	TD+	Transmit Data In	3	5
19	TD-	Inv. Transmit Data In	3	5
20	V <sub>EET</sub>	Transmitter Ground	1	

**Notes:**

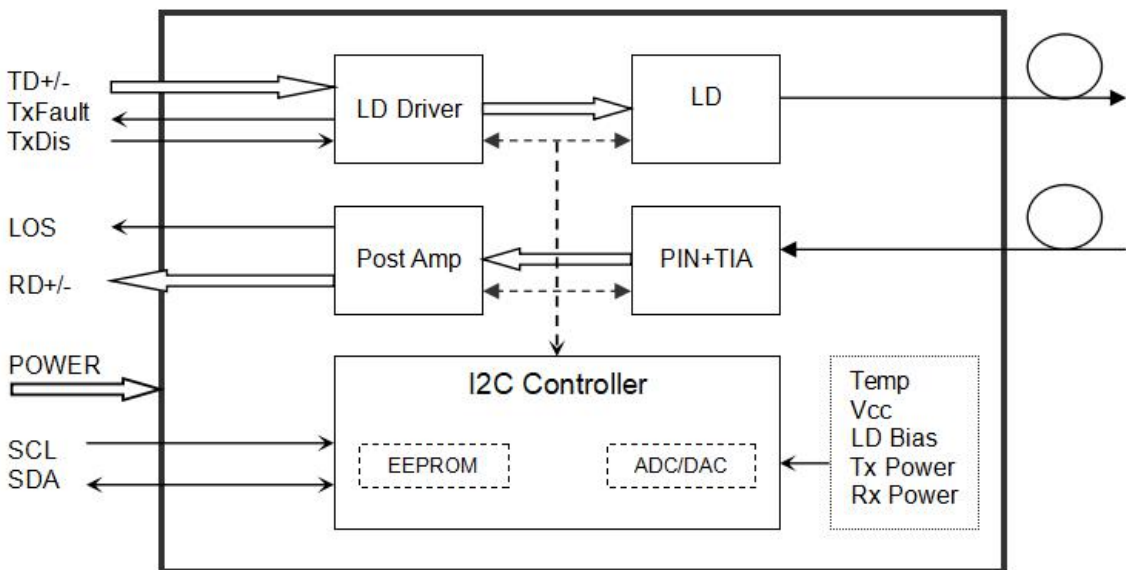
Plug Seq.: Pin engagement sequence during hot plugging.

1. TX Fault is an open collector output, which should be pulled up with a 4.7k~10kΩ resistor on the host board to a voltage between 2.0V and V<sub>cc</sub>+0.3V. Logic 0 indicates normal operation; Logic 1 indicates a laser fault of some kind. In the low state, the output will be pulled to less than 0.8V.
2. Laser output disabled on TDIS >2.0V or open, enabled on TDIS <0.8V.
3. LOS is open collector output. Should be pulled up with 4.7k~10kΩ on host board to a voltage between 2.0V and 3.6V. Logic 0 indicates normal operation; logic 1 indicates loss of signal.
4. RD-/+: These are the differential receiver outputs. They are internally AC-coupled 100 differential lines which should be terminated with 100Ω (differential) at the user SERDES.
5. TD-/+: These are the differential transmitter inputs. They are internally AC-coupled, differential lines with 100Ω differential termination inside the module.

### VII. Optical Module Block Diagram

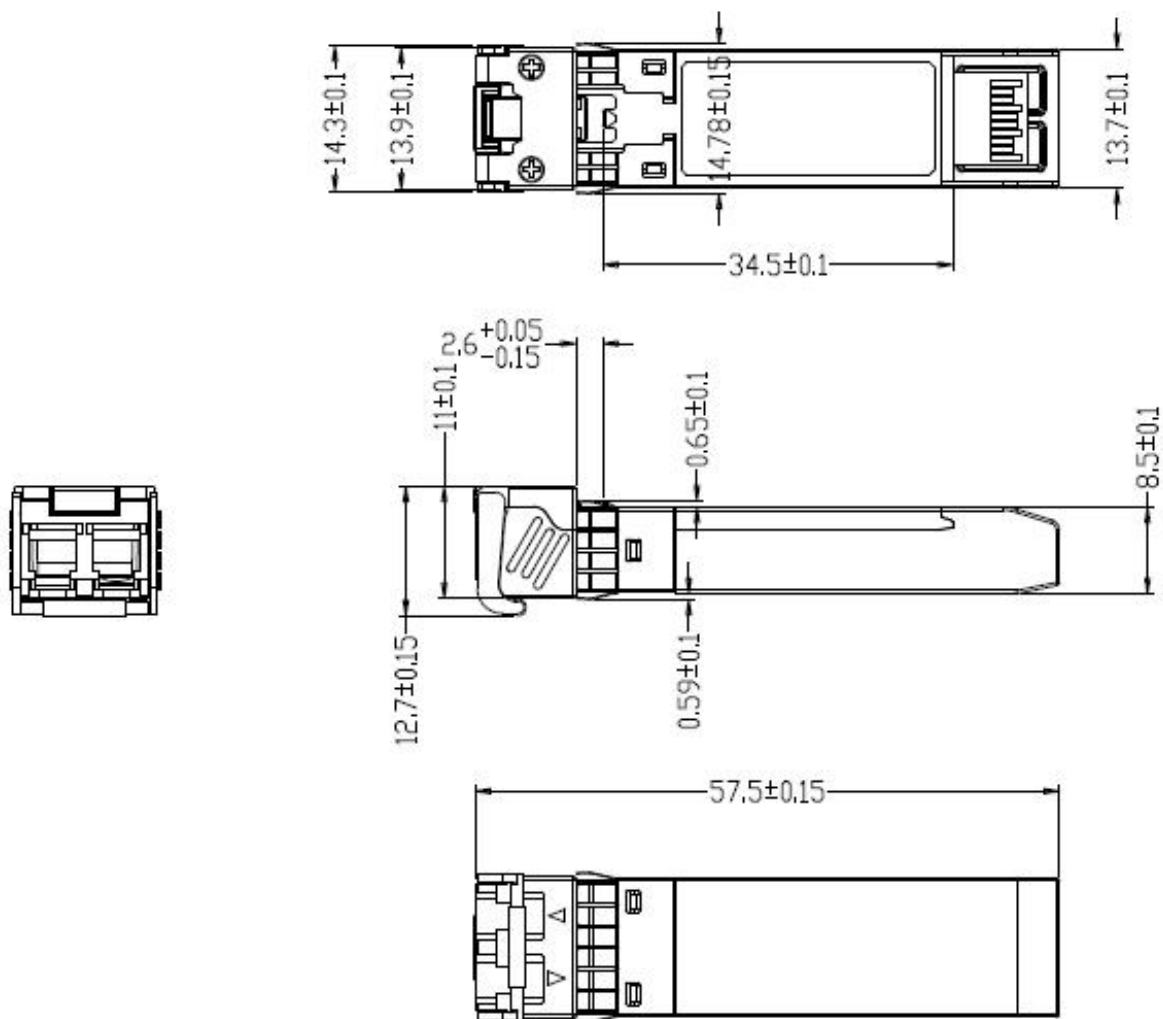


### VIII. Optical Module Block Diagram





### IX. Diagram Mechanical Drawing



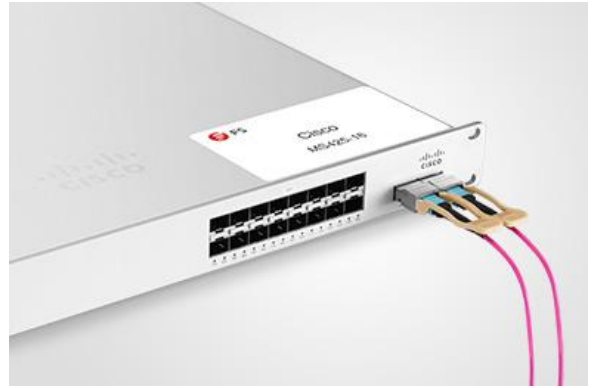
## Test Center

### I. Compatibility Testing

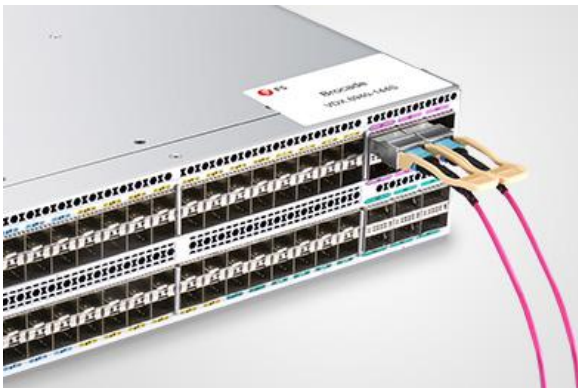
Each fiber optical transceiver has been tested in host device on site in FS Assured Program to ensure full compatibility with over 200 vendors.



Cisco Catalyst C9500-24Y4C



Cisco MS425-16



Brocade VDX 6940-144S



Dell EMC Networking Z9100-ON



Force<sup>10</sup> S60-44T

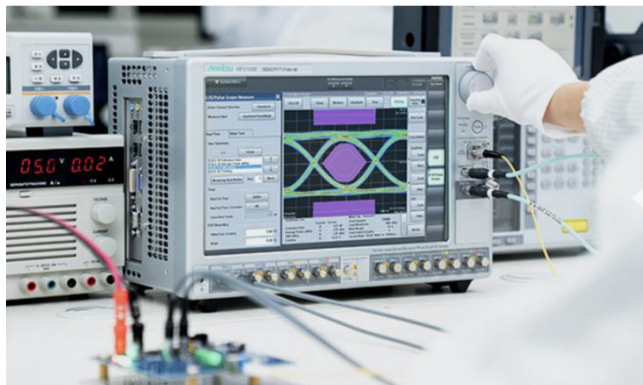


HUAWEI S6720-30L-HI-24S

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 Single Quality Testing

Equipped with the all-in-one tester integrated 4ch BERT & sampling oscilloscope, and variable optical attenuator 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 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 Networks Master Pro.

- Ethernet
- Fiber 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
SFP-16GSR-85	16G Fiber Channel SFP+ 850nm 100m DOM Transceiver Module
SFP-16GLR-31	16G Fiber Channel SFP+ 1310nm 10km DOM Transceiver Module
SFP-16GER-55	16G Fiber Channel SFP+ 1550nm 40km DOM Transceiver Module



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