

1000BASE-BX BiDi CSFP 1310nm-TX/1490nm-RX 10km DOM Transceiver

SFP-GE-2BX



Application

- Gigabit Ethernet(1000BASE-BX)
- Fiber Channel
- Point to Point FTTH Application
- Other optical transmission systems

Features

- Support 1.25Gbps data links
- Hot-Pluggable
- LC connector
- Up to 10km on 9/125 μ m SMF
- 1310nm FP laser transmitter
- 2XBi-directional transceivers in 1 SFP transceiver package
- Single +3.3V Power Supply
- Monitoring Interface Compliant with SFF-8472
- Operating temperature range:
Commercial: 0° C to 70° C
- RoHS compliant and Lead Free

Description

The CSFP transceivers are high performance, cost effective modules supporting 1.25Gbps and 10km transmission distance with SMF. Standard AC coupled CML for high speed signal and LVTTTL control and monitor signals.

This module is designed for Single-Mode single fiber, operates at the normal wavelength of TX1310nm/RX1490nm, 2channel. All modules satisfy class I laser safety requirements.

The transceivers are compatible with the Compact Small Form-Factor Pluggable (CSFP) Multi-Source Agreement (MSA) option 2, and SFF-8472.

For further information, please refer to CSFP MSA.

Product Specifications

I. Absolute Maximum Ratings

| Parameter | Symbol | Min | Typ. | Max | Unit | Ref. |
|----------------------------|----------|------|------|-----|------|------|
| Storage Temperature | T_S | -40 | | 85 | °C | |
| Supply Voltage | V_{CC} | -0.5 | | 4 | V | |
| Relative Humidity | RH | 0 | | 85 | % | |

II. Recommended Operating Environment

| Parameter | Symbol | Min | Typ. | Max | Unit | Ref. |
|-----------------------------------|-------------|-------|------|-------------|------|------|
| Case operating Temperature | T_C | 0 | | +70 | °C | |
| Supply Voltage | V_{CC} | 3.135 | 3.30 | 3.465 | V | |
| Supply Current | I_{CC} | | 300 | 450 | mA | |
| Inrush Current | I_{surge} | | | $I_{CC}+30$ | mA | |
| Maximum Power | P_{max} | | | 1.5 | W | |

III. Electrical Characteristics

| Parameter | Symbol | Min | Typ. | Max | Unit | Ref. |
|---------------------------------------|----------------|----------------|------|----------------|-------|------|
| Transmitter | | | | | | |
| Input differential impedance | R_{in} | 90 | 100 | 110 | Ω | 1 |
| Single ended data input swing | V_{inPP} | 200 | | 1200 | mVp-p | |
| Transmit Disable Voltage | V_D | $V_{CC} - 1.3$ | | V_{CC} | V | 2 |
| Transmit Enable Voltage | V_{EN} | V_{ee} | | $V_{ee} + 0.8$ | V | |
| Transmit Disable Assert Time | $T_{dessert}$ | | | 10 | us | |
| Receiver | | | | | | |
| Single ended data output swing | $V_{out,pp}$ | 300 | | 1000 | mv | 3 |
| LOS Fault | $V_{losfault}$ | $V_{CC} - 0.5$ | | V_{CC_host} | V | 5 |
| LOS Normal | $V_{losnorm}$ | V_{ee} | | $V_{ee} + 0.5$ | V | 5 |
| Power Supply Rejection | PSR | 100 | | | mVpp | 6 |

Note:

1. AC coupled.
2. Or open circuit.
3. Into 100 ohm differential termination.
4. 20 – 80 %
5. LOS is LVTTTL. Logic 0 indicates normal operation; logic 1 indicates no signal detected.
6. All transceiver specifications are compliant with a power supply sinusoidal modulation of 20 Hz to 1.5MHz up to specified value applied through the power supply filtering network shown on page 23 of the Small Form-factor Pluggable (SFP) Transceiver Multi-Source Agreement (MSA), September 14, 2000.

IV. Optical Characteristics

| Parameter | Symbol | Min | Typ. | Max | Unit | Ref. |
|-----------|--------|-----|------|-----|------|------|
|-----------|--------|-----|------|-----|------|------|

Transmitter (Tx)

| | | | | | | |
|------------------------------------|----------------|------|------|------|-------|---|
| Center Wavelength | λ_{CT} | 1290 | 1310 | 1330 | nm | |
| Spectral Width | σ | | | 3 | nm | |
| Side Mode Suppression Ratio | SMSR | 30 | | | dB | |
| Optical Output Power | P_{out} | -9 | | -3 | dBm | 1 |
| Extinction Ratio | ER | 8.2 | | | dB | |
| Optical Rise/Fall Time | t_r / t_f | | | 260 | ps | 2 |
| Relative Intensity Noise | RIN | | | -120 | dB/Hz | |

Output Eye Mask

Compliant with Eye Mask Defined in IEEE 802.3 standard

Receiver (Rx)

| | | | | | | |
|---------------------------------|----------------|------|------|------|-----|---|
| Optical Input Wavelength | λ_{cR} | 1470 | 1490 | 1510 | nm | |
| Receiver Overload | P_{ol} | -3 | | | dBm | 4 |
| RX Sensitivity | S_{en} | | | -23 | dBm | 4 |
| RX_LOS Assert | LOS_A | -35 | | | dBm | |
| RX_LOS De-assert | LOS_D | | | -24 | dBm | |
| RX_LOS Hysteresis | LOS_H | 0.5 | | | dB | |

General Specifications

| | | | | | | |
|-----------------------|-----|--|------------|--|------|--|
| Data Rate | BR | | 1.25 | | Gb/s | |
| Bit Error Rate | BER | | 10^{-12} | | | |

**Max. Supported Link Length on
9/125µm SMF@1.25Gb/s**

L_{MAX}

20

km

Total System Budget

LB

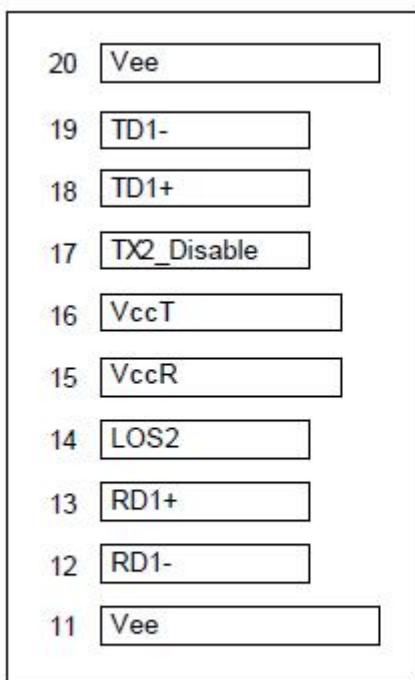
14

dB

Notes:

1. The optical power is launched into SMF.
2. 20-80%.
3. Jitter measurements taken using Agilent OMNIBERT 718 in accordance with GR-253.
4. Measured with PRBS 2²³-1 at 10⁻¹² BER

V. Pin Assignment



Top of Board



Bottom of Board
(as view through top of board)

2ch Compact SFP (Option 2) Electrical Pad Layout

VI.Pin Function Definitions

| Pin | Name | Function | Notes |
|-----|-------------|--|-------|
| 1 | Vee | Ground | 1 |
| 2 | TX Fault | Transmitter Fault Indication | 5 |
| 3 | TX1 Disable | Transmitter disable control of Channel 1, high signal disables optical output of Channel 1 | 2 |
| 4 | MOD-DEF2 | I2C data (SDA) | 3 |
| 5 | MOD-DEF1 | I2C clock (SCL) | 3 |
| 6 | TD2- | Inverted transmitter data input of Channel 2 (internally AC coupled) | 6 |
| 7 | TD2+ | Non-inverted transmitter data input of Channel 2 (internally AC coupled) | 6 |
| 8 | LOS1 | Open collector/drain output, high signal indicates los of signal in RX Channel 1 | 5 |
| 9 | RD2+ | Non-inverted receiver data output of Channel 2 (internally AC coupled) | 6 |
| 10 | RD2- | Inverted receiver data output of Channel 2 (internally AC coupled) | 6 |
| 11 | Vee | Ground | 1 |
| 12 | RD1- | Non-inverted receiver data output of Channel 1 (internally AC coupled) | 6 |
| 13 | RD1+ | Inverted receiver data output of Channel 1 (internally AC coupled) | 6 |
| 14 | LOS2 | Loss of Signal for channel 2 | 5 |
| 15 | VccR | Receiver Power | 1 |
| 16 | VccT | Transmitter Power | 1 |
| 17 | TX2 Disable | Transmitter disable control of Channel 2, high signal disables optical output of Channel 2 | 6 |
| 18 | TD1+ | Non-inverted transmitter data input of Channel 1 (internally AC coupled) | 6 |
| 19 | TD1- | Inverted transmitter data input of Channel 1 (internally AC coupled) | 6 |
| 20 | Vee | Ground | 1 |

Notes:

- 1.Circuit ground is internally isolated from chassis ground.
- 2.Laser output disabled on TDIS >2.0V or open, enabled on TDIS <0.8V.
- 3.Should be pulled up with 4.7k - 10 kΩ on host board to a voltage between 2.0V and 3.6V.MOD_DEF(0) pulls line low to indicate module is plugged in.
- 4.Rate select is not used
- 5.LOS is open collector output. Should be pulled up with 4.7k – 10 kΩ on host board to a voltage between 2.0V and 3.6V. Logic 0 indicates normal operation; logic 1 indicates loss of signal.
- 6.AC Coupled

VII.SFP Module EEPROM Information and Management

The SFP modules implement the 2-wire serial communication protocol as defined in the SFP -8472.The serial ID information of the SFP modules and Digital Diagnostic Monitor parameters can be accessed through the I2C interface at address A0h and A2h.

The memory is mapped in Table 1.

Detailed ID information(A0h) is listed in Table 2.

And the DDM specification is at address A2h.

For more details of the memory map and byte definitions, please refer to the SFF-8472, “Digital Diagnostic Monitoring Interface for Optical Transceivers”.The DDM parameters have been internally calibrated.

Table 1. Digital Diagnostic Memory Map (Specific Data Field Descriptions)

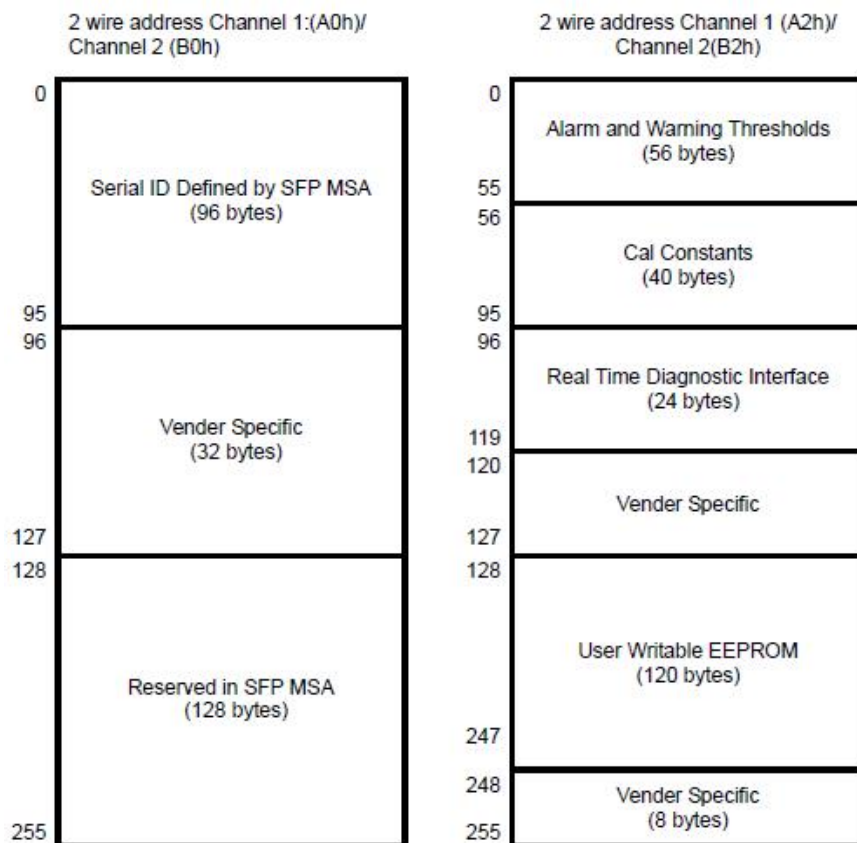


Table 2. EEPROM Serial ID Memory Contents (A0h)

| Data Address | Length(Byte) | Name of Length | Description and Contents |
|----------------|--------------|----------------|--|
| Base ID Fields | | | |
| 0 | 1 | Identifier | Type of Serial transceiver (03h=SFP) |
| 1 | 1 | Reserved | Extended identifier of type serial transceiver (04h) |
| 2 | 1 | Connector | Code of optical connector type (07=LC) |
| 3-10 | 8 | Transceiver | |
| 11 | 1 | Encoding | NRZ(03h) |
| 12 | 1 | BR, Nominal | Nominal baud rate, unit of 100Mbps |
| 13-14 | 2 | Reserved | (0000h) |
| 15 | 1 | Length(9um) | Link length supported for 9/125um fiber, units of 100m |
| 16 | 1 | Length(50um) | Link length supported for 50/125um fiber, units of 10m |
| 17 | 1 | Length(62.5um) | Link length supported for 62.5/125um fiber, units of 10m |
| 18 | 1 | Length(Copper) | Link length supported for copper, units of meters |
| 19 | 1 | Reserved | |
| 20-35 | 16 | Vendor Name | SFP vendor name: FS |
| 36 | 1 | Reserved | |
| 37-39 | 3 | Vendor OUI | SFP transceiver vendor OUI ID |
| 40-55 | 16 | Vendor PN | Part Number: "SFP-GE-2BX-34" (ASCII) |
| 56-59 | 4 | Vendor rev | Revision level for part number |
| 60-62 | 3 | Reserved | |
| 63 | 1 | CCID | Least significant byte of sum of data in address 0-62 |

Extended ID Fields

| | | | |
|-------|----|-----------|--|
| 64-65 | 2 | Option | Indicates which optical SFP signals are implemented(001Ah = LOS, TX_FAULT, TX_DISABLE all supported) |
| 66 | 1 | BR, max | Upper bit rate margin, units of % |
| 67 | 1 | BR, min | Lower bit rate margin, units of % |
| 68-83 | 16 | Vendor SN | Serial number (ASCII) |
| 84-91 | 8 | Date code | FS's Manufacturing date code |
| 92-94 | 3 | Reserved | |
| 95 | 1 | CCEX | Check code for the extended ID Fields (addresses 64 to 94) |

Vendor Specific ID Fields

| | | | |
|---------|-----|----------|-----------------------------|
| 96-127 | 32 | Readable | FS specific date, read only |
| 128-255 | 128 | Reserved | Reserved for SFF-8079 |

Table 3. Diagnostics Memory Contents (A2h B2h)

| Data Address | Length(Byte) | Name ofLength | Description and Contents |
|--------------------------------------|--------------|-------------------|--|
| Diagnostic and control/status fields | | | |
| 0-39 | 40 | A/W Thresholds | Diagnostic Flag Alarm and Warning Thresholds |
| 40-55 | 16 | Unallocated | |
| 56-91 | 16 | Ext Cal Constants | Diagnostic calibration constants for optional External Calibration |
| 92-94 | 3 | Unallocated | |
| 95 | 1 | CC_DMI | Check code for Base Diagnostic Fields (addresses 0 to 94) |
| 96-105 | 10 | Diagnostics | Diagnostic Monitor Data (internally or externally calibrated) |
| 106-109 | 4 | Unallocated | |
| 110 | 1 | Status/Control | Optional Status and Control Bits |
| 111 | 1 | Reserved | Reserved for SFF-8079 |

| | | | |
|--------------------|-----|--------------------|--|
| 112-113 | 2 | Alarm Flags | Diagnostic Alarm Flag Status Bits |
| 114-115 | 2 | Unallocated | |
| 116-117 | 2 | Warning Flags | Diagnostic Warning Flag Status Bits |
| 118-119 | 2 | Ext Status/Control | Extended module control and status bytes |
| General use fields | | | |
| 120-127 | 8 | Vendor Specific | Vendor specific memory addresses |
| 128-247 | 120 | User EEPROM | User writable non-volatile memory |
| 248-255 | 8 | Vendor Control | Vendor specific control addresses |

Table 4. Digital Diagnostics Monitor Characteristics

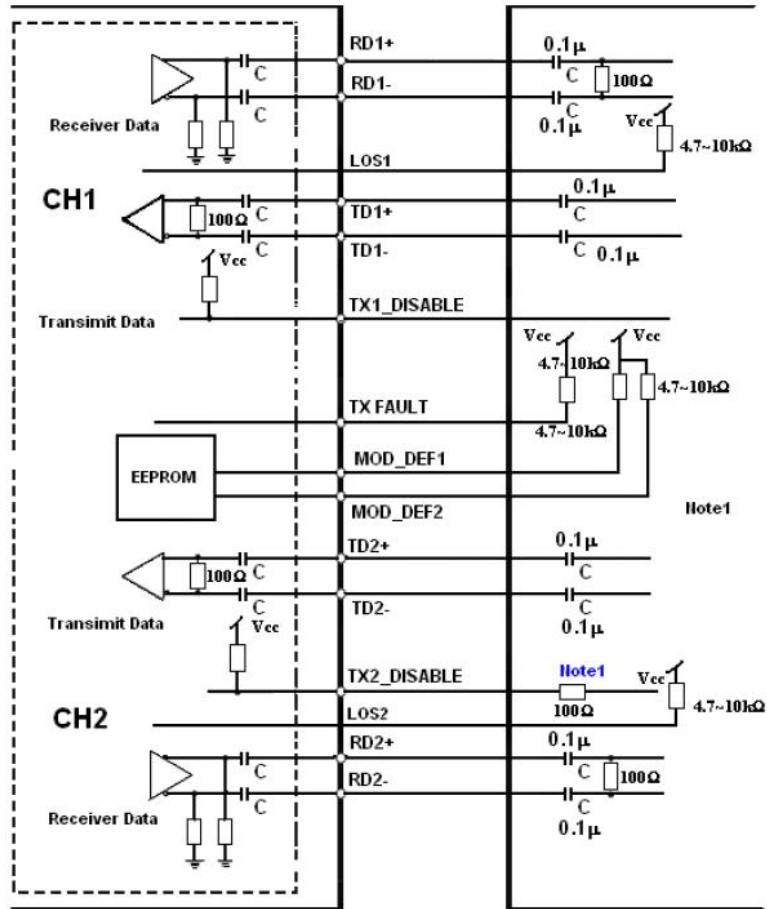
| Data Address | Parameter | Accuracy | Unit |
|--------------|----------------------------------|----------|------|
| 96-97 | Transceiver Internal Temperature | ± 3.0 | ° C |
| 98-99 | VCC3 Internal Supply Voltage | ± 3.0 | % |
| 100-101 | Laser Bias Current | ± 10 | % |
| 102-103 | Tx Output Power | ± 3.0 | dBm |
| 104-105 | Rx Input Power | ± 3.0 | dBm |

VI.Regulatory Compliance

The SFP-GE-2BX-34 complies with international Electromagnetic Compatibility (EMC) and international safety requirements and standards (see details in Table following).

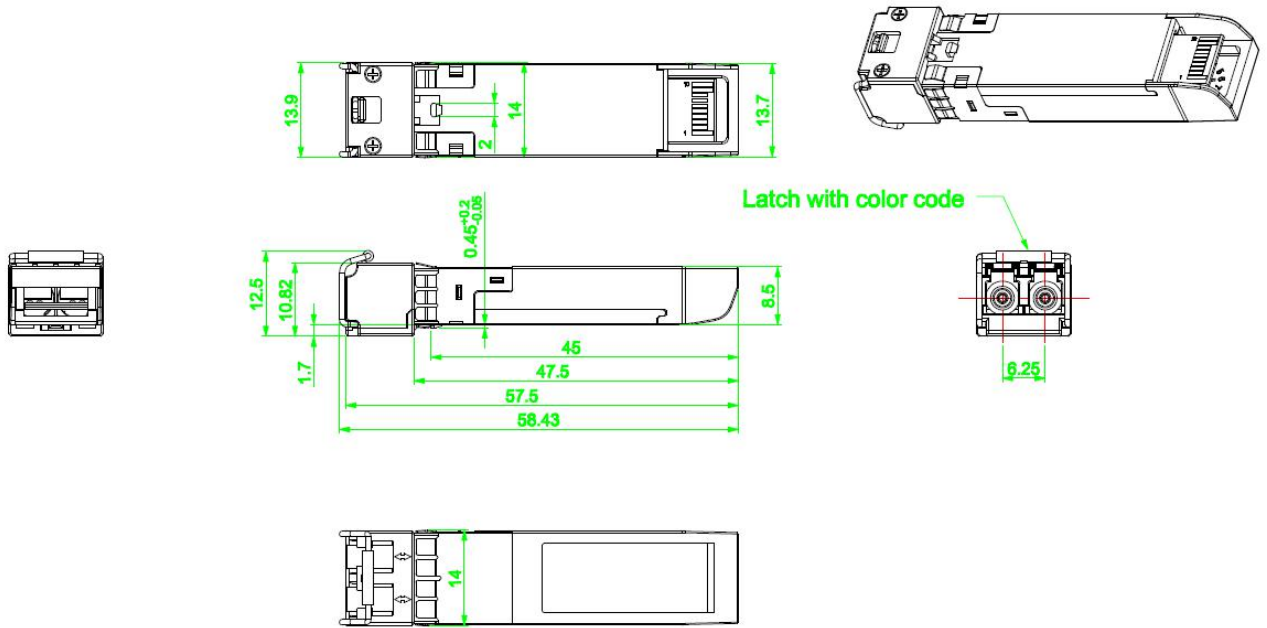
| | | |
|---|--|--|
| Electrostatic Discharge(ESD) to the Electrical Pins | MIL-STD-883E Method 3015.7 | Class 1(>1000 V) |
| Electrostatic Discharge (ESD) to the Duplex LC Receptacle | IEC 61000-4-2GR-1089-CORE | Compatible with standards |
| Electromagnetic Interference (EMI) | FCC Part 15 Class B EN55022 Class B (CISPR 22)VCCI Class B | Compatible with standards |
| Laser Eye Safety | FDA 21CFR 1040.10 and 1040.11 EN60950, EN (IEC) 60825-1,2 | Compatible with Class 1 laser product. |

VIII. Recommend Circuit



Note1: Recommendation 100_ series resistance on host board

IX. Mechanical Specifications



Mechanical Drawing

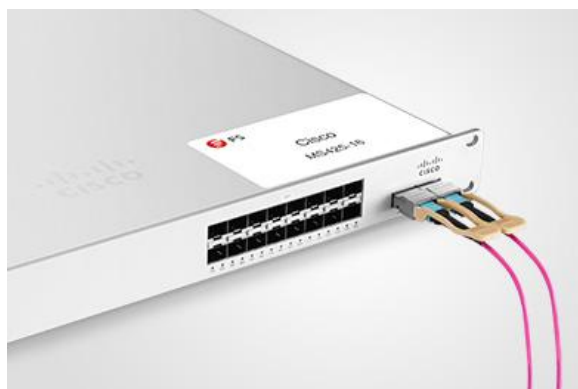
Test Center

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@tm S60-44T

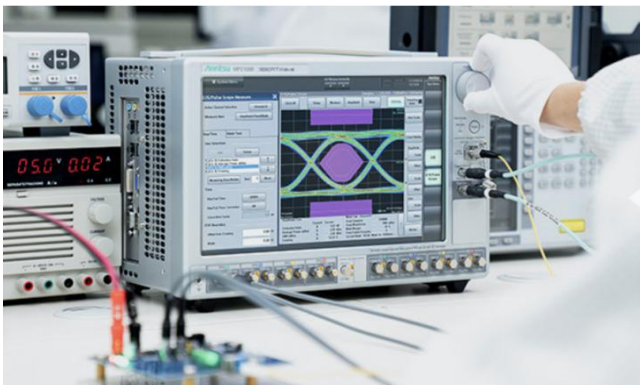


HUAWEI S6720-30L-HI-24S

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 Single Quality Testing

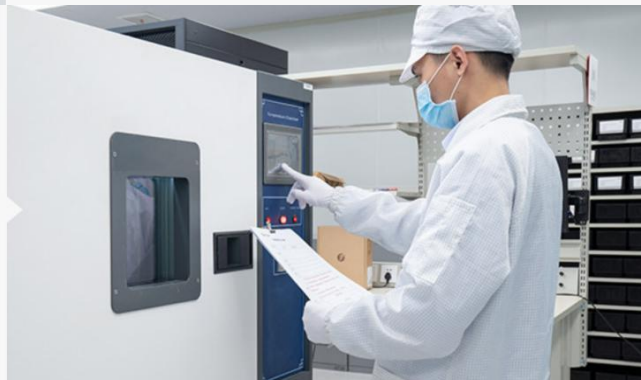
Equipped with the all-in-one tester integrated 4ch BERT & sampling oscilloscope, and variable optical attenuator the input and output signal quality.

- 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

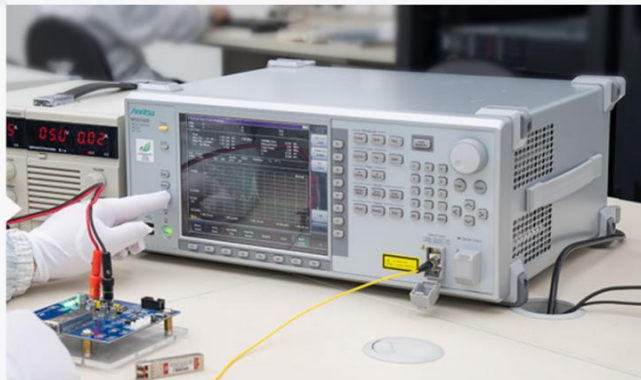
Test the actual transfer data rate and the transmission ability under different protocols with Networks Master Pro.

- 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-GE-BX | SFP, BIDI, 1000Base, 1310TX/1490nmRX, SMF, 10km, LC simplex, DOM |
| SFP-GE-BX | SFP, BIDI, 1000Base, 1490TX/1310nmRX, SMF, 10km, LC simplex, DOM |
| SFP-GE-BX | SFP, BIDI, 1000Base, 1310TX/1550nmRX, SMF, 10km, LC simplex, DOM |
| SFP-GE-BX | SFP, BIDI, 1000Base, 1550TX/1310nmRX, SMF, 10km, LC simplex, DOM |
| SFP-GE-BX | SFP, BIDI, 1000Base, 1310TX/1490nmRX, SMF, 20km, LC simplex, DOM |
| SFP-GE-BX | SFP, BIDI, 1000Base, 1490TX/1310nmRX, SMF, 20km, LC simplex, DOM |
| SFP-GE-BX | SFP, BIDI, 1000Base, 1310TX/1550nmRX, SMF, 20km, LC simplex, DOM |
| SFP-GE-BX | SFP, BIDI, 1000Base, 1550TX/1310nmRX, SMF, 20km, LC simplex, DOM |
| SFP-GE-BX40 | SFP, BIDI, 1000Base, 1310TX/1490nmRX, SMF, 40km, LC simplex, DOM |
| SFP-GE-BX40 | SFP, BIDI, 1000Base, 1490TX/1310nmRX, SMF, 40km, LC simplex, DOM |
| SFP-GE-BX40 | SFP, BIDI, 1000Base, 1310TX/1550nmRX, SMF, 40km, LC simplex, DOM |
| SFP-GE-BX40 | SFP, BIDI, 1000Base, 1550TX/1310nmRX, SMF, 40km, LC simplex, DOM |
| SFP-GE-BX80 | SFP, BIDI, 1000Base, 1490TX/1550nmRX, SMF, 80km, LC simplex, DOM |
| SFP-GE-BX80 | SFP, BIDI, 1000Base, 1550TX/1490nmRX, SMF, 80km, LC simplex, DOM |
| SFP-GE-BX80 | SFP, BIDI, 1000Base, 1490TX/1570nmRX, SMF, 80km, LC simplex, DOM |
| SFP-GE-BX80 | SFP, BIDI, 1000Base, 1570TX/1490nmRX, SMF, 80km, LC simplex, DOM |
| SFP-GE-BX120 | SFP, BIDI, 1000Base, 1490TX/1550nmRX, SMF, 120km, LC simplex, DOM |
| SFP-GE-BX120 | SFP, BIDI, 1000Base, 1550TX/1490nmRX, SMF, 120km, LC simplex, DOM |
| SFP-GE-BX120 | SFP, BIDI, 1000Base, 1510TX/1590nmRX, SMF, 120km, LC simplex, DOM |
| SFP-GE-BX120 | SFP, BIDI, 1000Base, 1590TX/1510nmRX, SMF, 120km, LC simplex, DOM |
| SFP-GE-2BX | SFP, BIDI, 2-channel, 1000Base, 1490TX/1310nmRX, SMF, 10km, Dual LC, DOM |
| SFP-GE-2BX | SFP, BIDI, 2-channel, 1000Base, 1310TX/1490nmRX, SMF, 10km, Dual LC, DOM |

Note:

BIDI SFP transceiver module is individually tested on corresponding equipment such as Cisco, Arista, Juniper, Dell, Brocade and other brands, and passes the monitoring of FS.COM intelligent quality control system.



 <https://www.fs.com>



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