

OC-48/STM-16 SR-1 SFP 1310nm 2km DOM LC SMF Transceiver

SFP-2GSR-31-LL



Applications

- SONET OC48 / SDH STM-16
- SONET OC-12 / SDH STM -4
- SONET OC-3 / SDH STM -1
- 1X/2X Fiber Channel
- Other Optical Link

Features

- Up to 2.5Gb/s Data Links
- Hot-Pluggable
- 1310nm FP Laser Transmitter
- Duplex LC Connector
- RoHS Compliant and Lead Free
- Up to 2km on 9/125 μ m SMF
- Single +3.3V Power Supply
- Monitoring Interface Compliant with SFF-8472
- Commercial Operating Temperature Range: 0°C to 70°C

Description

SFP 2.5Gb/s LR 2km transceiver is a high performance, cost effective module which has a duplex LC optics interface. Standard DC coupled CML for high speed signal and LVTTTL control and monitor signals. The receiver section uses a PIN receiver and the transmitter uses 1310 nm FP laser, up to 8dB link budget ensures this module STM-16/OC-48 2km application.

Product Specifications

I. Absolute Maximum Ratings

| Parameter | Symbol | Min. | Typical | Max. | Unit |
|---------------------|----------|------|---------|------|------|
| 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. | Typical | Max. | Unit |
|----------------------------|---------------------|-------|---------|-------------|------|
| Case Operating Temperature | Commercial T_C | 0 | | +70 | °C |
| Supply Voltage | V_{CC} | 3.135 | | 3.465 | V |
| Supply Current | I_{CC} | | | 300 | mA |
| Inrush Current | I_{surge} | | | $I_{CC}+30$ | mA |
| Maximum Power | P_{max} | | | 0.7 | W |

III. Electrical Characteristics (TOP = T_c ° C, V_{CC} = 3.0 to 3.60 Volts)

| Parameter | Symbol | Min. | Typical | Max. | Unit | Note |
|---|-----------------------|-----------------------|---------|-----------------------|-------|------|
| Transmitter Section | | | | | | |
| Input Differential Impedance | R _{in} | 90 | 100 | 110 | | |
| Single Ended Data Input Swing | V _{in} PP | 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 Section | | | | | | |
| Single Ended Data Output Swing | V _{out} pp | 300 | | 1000 | mv | 3 |
| Data Output Rise Time | t _r | | | 260 | ps | 4 |
| Data Output Fall Time | t _f | | | 260 | ps | 4 |
| LOS Fault | V _{losfault} | V _{CC} - 0.5 | | V _{CC} _host | V | 5 |
| LOS Normal | V _{los norm} | V _{ee} | | V _{ee} +0.5 | V | 5 |
| Power Supply Rejection | PSR | 100 | | | mVpp | 6 |
| Total Generated Receiver Jitter (peak to peak) | J _{RXp-p} | | | 0.07 | UI | |
| Total Generated Receiver Jitter (rms) | J _{RXrms} | | | 0.007 | UI | |

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 Parameters (TOP =TC, V_{CC} = 3.0 to 3.60 Volts)

| Parameter | Symbol | Min. | Typical | Max. | Unit | Note |
|-----------|--------|------|---------|------|------|------|
|-----------|--------|------|---------|------|------|------|

Transmitter Section

| | | | | | | |
|--|---|------|------|-------|-------|---|
| Center Wavelength | λ_c | 1270 | 1310 | 1360 | nm | |
| Spectral Width (RMS) | σ_{RMS} | | | 4 | nm | |
| Optical Output Power | P_{out} | -10 | | -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 | |
| Total Generated Transmitter Jitter (peak to peak) | J_{TXp-p} | | | 0.07 | UI | |
| Total Generated Transmitter Jitter(rms) | J_{TXrms} | | | 0.007 | UI | |
| Output Eye Mask | Compliant with eye mask Telcordia GR-253-GORE | | | | | |

Receiver Section

| | | | | | | |
|--------------------------------------|-------------|------|--|------|-----|---|
| Optical Input Wavelength | λ_c | 1260 | | 1360 | nm | |
| RX Sensitivity @ OC-48/STM-16 | Sen1 | | | -18 | dBm | 3 |

| Parameter | Symbol | Min. | Typical | Max. | Unit | Note |
|--|------------------|------|---------|------|------|------|
| RX Sensitivity @ 2xFibre Channel | Sen2 | | | -19 | dBm | 4 |
| RX Sensitivity @ Gigabit Ethernet | Sen3 | | | -19 | dBm | 4 |
| RX Sensitivity @ OC-12/STM-4 | Sen4 | | | -19 | dBm | 5 |
| RX Sensitivity @ OC-4/STM-1 | Sen5 | | | -19 | dBm | 5 |
| RX_LOS A_{assert} | LOS _A | -35 | | | dBm | |
| RX_LOS D_{e-assert} | LOS _D | | | -19 | dBm | |
| RX_LOS Hysteresis | LOS _H | 0.5 | | | dB | |

V. General Specifications

| Parameter | Symbol | Min. | Typical | Max. | Unit | Note |
|---|-------------------|------|---------|-------------------|------|------|
| Data Rate | BR | 155 | | 2667 | Mb/s | |
| Bit Error Rate | BER | | | 10 ⁻¹² | | |
| Max. Supported Link Length on 9/125µm SMF @ OC-48/STM-16 | L _{MAX1} | | 2 | | km | |
| Max. Supported Link Length on 9/125µm SMF @ 2xFibre Channel | L _{MAX2} | | 5 | | km | |
| Max. Supported Link Length on 9/125µm SMF @ Gigabit Ethernet | L _{MAX3} | | 10 | | km | |
| Max. Supported Link Length on 9/125µm SMF @ OC-12/STM-4 | L _{MAX4} | | 10 | | km | |
| Max. Supported Link Length on 9/125µm SMF @ OC-4/STM-1 | L _{MAX5} | | 10 | | km | |

Note:

- Compliant with FDA/CDRH and EN (IEC) 60825 regulations (Class 1 Laser Safety).

- 2. 20-80%.
- 3. Measured with PRBS 231-1 at 10-12 BER.
- 4. Measured with PRBS 27-1 at 10-12 BER.
- 5. Measured with PRBS 223-1 at 10-12 BER.

VI. Digital Diagnostic Monitor Characteristics (A2h)

| Data Address | Parameter | Accuracy | Unit |
|--------------|--|----------|------|
| 96-97 | Transceiver Internal Temperature | ± 3.0 | ° C |
| 98-99 | V _{CC3} Internal Supply Voltage | ± 5.0 | % |
| 100-101 | Laser Bias Current | ± 10 | % |
| 102-103 | Tx Output Power | ± 3.0 | dBm |
| 104-105 | Rx Input Power | ± 3.0 | dBm |

VII. Regulatory Compliance

The OP3602D 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 BEN55022 Class B (CISPR 22B) V _{CC} I Class B | Compatible with standards |

VIII. Pin Assignment

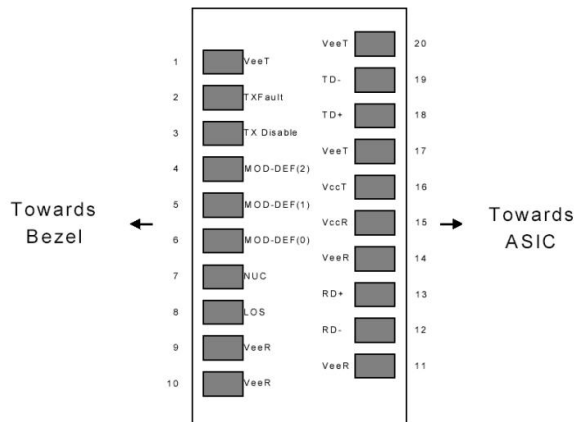


Figure 1. Diagram of Host Board Connector Block Pin Numbers and Names

IX. Pin Description

| Pin No | Name | Function | Plug Seq | Notes |
|--------|-------------|------------------------------|----------|-------|
| 1 | V_{eeT} | Transmitter Ground | 1 | 1 |
| 2 | TX Fault | Transmitter Fault Indication | 3 | |
| 3 | TX Disable | Transmitter Disable | 3 | 2 |
| 4 | MOD-DEF2 | Module Definition | 2 | 3 |
| 5 | MOD-DEF1 | Module Definition 1 | 3 | 3 |
| 6 | MOD-DEF0 | Module Definition 0 | 3 | 3 |
| 7 | Rate Select | Not Connected | 3 | 4 |
| 8 | LOS | Loss of Signal | 3 | 5 |
| 9 | V_{eeR} | Receiver Ground | 1 | 1 |
| 10 | V_{eeR} | Receiver Ground | 1 | 1 |
| 11 | V_{eeR} | Receiver Ground | | 1 |
| 12 | RD- | Inv.Received Data Out | 3 | 6 |
| 13 | RD+ | Received Data Out | 3 | 6 |
| 14 | V_{eeR} | Receiver Ground | 3 | 1 |
| 15 | V_{ccR} | Receiver Power | 2 | 1 |
| 16 | V_{ccT} | Transmitter Power | 2 | |

| Pin No | Name | Function | Plug Seq | Notes |
|--------|-------------------|--------------------|----------|-------|
| 17 | V _{ee} T | Transmitter Ground | 1 | |
| 18 | TD+ | Transmit Data In | 3 | 6 |
| 19 | TD- | Inv.Transmit In | 3 | 6 |
| 20 | V _{ee} T | Transmitter 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 kohms 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 kohms 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.

X. Recommended Circuit

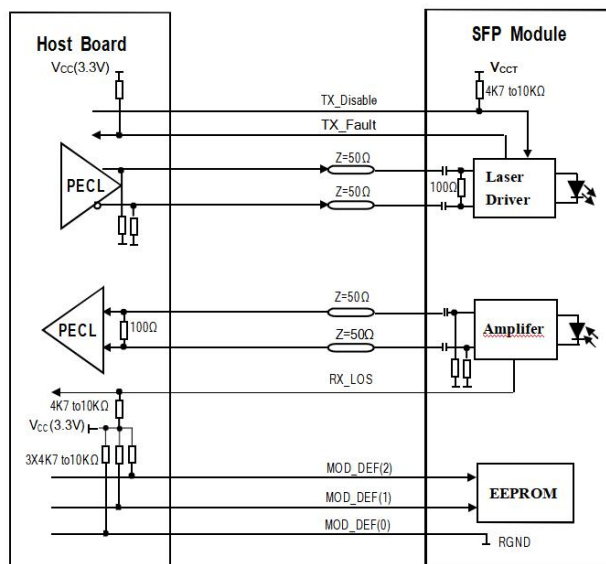


Figure 2. SFP Host Recommended Circuit

XI. Serial ID Memory Contentsn

| Data Address | Length(Byte) | Name of Length | Description and Contents |
|-----------------------|--------------|-----------------|--|
| Base ID Fields | | | |
| 0 | 1 | Identifier | Type ofSerial 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 | 1 | Reserved | (0000h) |
| 14 | 1 | Length (9um,km) | Link length supported for 9/125um fiber, units of km |
| 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: |
| 36 | 1 | Reserved | |
| 37-39 | 3 | Vendor OUI | SFP transceiver vendor OUI ID |

| Data Address | Length(Byte) | Name of Length | Description and Contents |
|----------------------------------|--------------|------------------|---|
| 40-55 | 16 | Vendor PN | PartNumber: "LonglineXXXXXX" (ASCII) |
| 56-59 | 4 | Vendor rev | Revision level for part number |
| 60-61 | 2 | Wavelength | Laser wavelength |
| 62 | 1 | 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 | Manufacturing date code |
| 92 | 1 | Diagnostic Type | Diagnostics |
| 93 | 1 | Enhanced Options | Diagnostics |
| 94 | 1 | SFF-8472 | Diagnostics |
| 95 | 1 | CCEX | Check code for the extended ID Fields (addresses 64 to 94) |
| Vendor Specific ID Fields | | | |
| 96-127 | 32 | Readable | Vendor specific data, readonly |

| Data Address | Length (Byte) | Name of Length | Description and Contents |
|--------------|---------------|----------------|--------------------------|
| 128-255 | 128 | Reserved | Reserved for SFF-8079 |

XII. Mechanical Dimensions

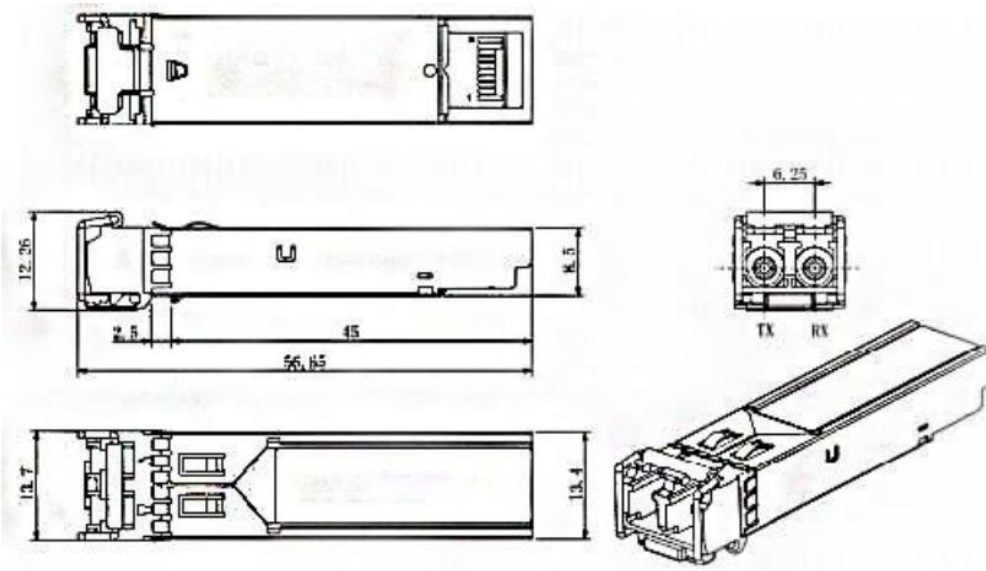


Figure 3. Mechanical Drawing