

OP-2G31-10 2.5G SFP Module, SM 1310nm 10km Duplex LC

1. Features

- Operating data rate up to 2.5Gbps
- 1310nm DFB laser transmitter and PIN photodetector
- Single 3.3V power supply
- Hot-pluggable SFP footprint
- Duplex LC connector interface
- Metal Enclosure for lower EMI
- 10km transmission on on 9/125 μ m SMF
- Compliant with SFP MSA and digital diagnostic SFF-8472
- Class 1 laser safety certified
- Compliant with RoHS



2. Applications

- 1x Fiber Channel
- Gigabit Ethernet Switches and Routers
- Other Optical Links

Description

OP-2G31-10 Small Form Factor Pluggable (SFP) transceiver is designed for data communication on Singlemode fiber and operates at a nominal wavelength of 1310nm up to 10km. The transceiver consists of five sections: the DFB laser transmitter, the LD driver, the PIN photodiode, the limiting amplifier and the MCU control unit. Compatible with Small Form Factor Pluggable Multi-Sourcing Agreement (MSA).

Absolute Maximum Ratings

| Parameter | Symbol | Min. | Max. | Unit |
|---------------------|--------|------|------|------|
| Storage Temperature | Ts | -40 | 85 | °C |
| Supply Voltage | Vcc | -0.5 | 4 | V |
| Operating Humidity | RH | 5 | 95 | % |
| Power Consumption | | | 1.2 | W |

Recommended Operating Conditions

| Parameter | | Symbol | Min. | Typical | Max. | Unit |
|-----------------------|-----------------|--------|------|---------|------|------|
| Operating Temperature | Case Commercial | Tc | 0 | | 70 | °C |
| | Case Extended | Tc | -10 | | 85 | °C |



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| | | | | | | |
|----------------------|------------|-----|------|-----|------|------|
| | Industrial | Tc | -40 | | 85 | °C |
| Power Supply Voltage | | Vcc | 3.15 | 3.3 | 3.45 | V |
| Power Supply Current | | Icc | | | 300 | mA |
| Data Rate | | - | | 2.5 | | Gbps |

Optical Characteristics

| Parameter | Symbol | Min. | Typical | Max. | Unit |
|-------------------------------------|----------------------------|------|---------|------|------|
| Transmitter | | | | | |
| Centre Wavelength | λ_c | 1260 | 1310 | 1360 | nm |
| Average Output Power | Po | -5 | | 0 | dBm |
| Extinction Ratio | Er | 9 | | | dB |
| Spectral Width(RMS) | σ | | | 0.85 | nm |
| Optical Rise/Fall Time (20%~80%) | t_r/t_f | | | 0.26 | ns |
| Total Jitter | Tj | | | 0.28 | UI |
| Output Optical Eye Mask | Compliant with IEEE 802.3z | | | | |
| Receiver | | | | | |
| Center Wavelength | λ_c | 1260 | 850 | 1360 | nm |
| Receiver Sensitivity | S | | | -20 | dBm |
| Receiver Overload | P _{in} | -3 | | | dBm |
| LOS De-Assert | LOS _D | | | -18 | dBm |
| LOS Assert | LOS _A | -35 | | | dBm |
| LOS Hysteresis | | 0.5 | 3 | 5 | dB |

Notes:

1. PECL input, internally AC-coupled
2. The optical power is launched into MMF
3. Filtered measured with a PRBS 2⁷-1 test pattern @2.5Gbps, BER ≤ 1x10⁻¹²

Electrical Characteristics

| Parameter | Symbol | Min. | Typ. | Max. | Unit |
|-------------------------------|-----------------|------|------|---------|------|
| Transmitter | | | | | |
| Data Input Swing Differential | V _{in} | 1260 | 1310 | 1360 | mV |
| Input Differential Impedence | Z _{in} | 90 | 100 | 110 | ohm |
| TX Disable | Disable | | 2 | Vcc | V |
| | Enable | | 0 | 0.8 | V |
| TX Fault | Fault | | 2 | Vcc+0.3 | V |



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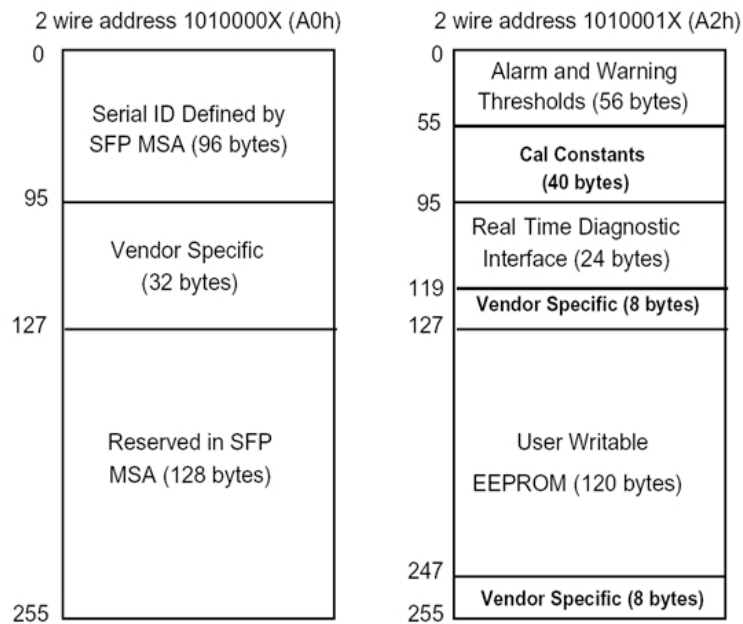
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| | | | | | | |
|--------------------------------|--------|------|------|--|---------|----|
| | Normal | | 0 | | 0.8 | V |
| Receiver | | | | | | |
| Data Output Swing Differential | | Vout | 1260 | | 1610 | mV |
| Rx_LOS | High | | 2 | | Vcc+0.3 | V |
| | Low | | 0 | | 0.8 | V |

Digital Diagnostic Memory Map



The SFP MAS defines a 256-byte memory map in EEPROM describing the transceiver's manufacturer, part no, standard interfaces, serial no and other information, which is accessible over a 2 wire serial interface at address A0h. The memory contents are shown in below table:

| Addr. | Field Size (Bytes) | Name of Field | Hex | Description |
|-------|--------------------|-----------------|-----|-------------|
| 0 | 1 | Identifier | 03 | SFP |
| 1 | 1 | Ext. Identifier | 04 | MOD4 |
| 2 | 1 | Connector | 07 | LC |
| 3-10 | 8 | Transceiver | XXX | 1000Base-LX |
| 11 | 1 | Encoding | 01 | 8B10B |
| 12 | 1 | BR, nominal | 0D | 2.5bps |
| 13 | 1 | Reserved | 00 | |
| 14 | 1 | Length (9um)-km | | 10KM |
| 15 | 1 | Length (9um) | | |



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| | | | | |
|--------|-----|-------------------------------|--|--|
| 16 | 1 | Length (50um) | | |
| 17 | 1 | Length (62.5um) | | |
| 18 | 1 | Length (copper) | 00 | Not Compliant |
| 19 | 1 | Reserved | 00 | |
| 20-35 | 16 | Vendor name | 57 49 4E 54 4F 50 20 20 20 20 20 20 20 20 20 20 | |
| 36 | 1 | Reserved | 00 | |
| 37-39 | 3 | Vendor OUI | 00 00 00 | |
| 40-55 | 16 | Vendor PN | xx xx xx xx xx xx xx xx xx xx xx xx xx xx xx xx | xx (ASC II) |
| 56-59 | 4 | Vendor rev | 31 2E 30 20 | V1.0 |
| 60-61 | 2 | Wavelength | 06 0E | 1310nm |
| 62 | 1 | Reserved | 00 | |
| 63 | 1 | CC BASE | XX | Check sum of bytes 0~62 |
| 64-65 | 2 | Options | 00 1A | LOS, TX_FAULT and TX_DISABLE |
| 66 | 1 | BR, max | 00 | |
| 67 | 1 | BR, min | 00 | |
| 68-83 | 16 | Vendor SN | xx xx xx xx xx xx xx xx xx xx xx xx xx xx xx xx | ASC II |
| 84-91 | 8 | Vendor date code | xx xx xx xx xx xx 20 20 | Year, Month, Day |
| 92 | 1 | Diagnostic Monitoring type | XX | Diagnostics (External. Cal) |
| 93 | 1 | Enhanced option | XX | Optional Alarm/warning flags, Soft TX_FAULT and Soft TX_LOS monitoring) |
| 94 | 1 | SFF-8472 | XX | Diagnostics (SFF-8472 Rev 9.4) |
| 95 | 1 | CC_EXT | XX | Check sum of bytes 64~94 |
| 96-255 | 160 | Vendor specific | | |

The digital diagnostic monitoring interface also defines another 256-byte memory map in EEPROM, which makes use of the 8 bit address 1010001X (A2h). It allows real-time access to transceiver's working temperature, laser bias current, transmitted optical power, receiver sensitivity and supply voltage. Please see below Figure for detailed information:

| Parameter | | Range | Accuracy | Calibration |
|--------------|------------|-------------|----------|-------------|
| Temperature | Commercial | 0 to 70°C | ±3°C | Internal |
| | Extended | -10 to 80°C | ±3°C | Internal |
| | Industrial | -40 to 85°C | ±3°C | Internal |
| Voltage | | 3.0 to 3.6V | ±10% | |
| Bias Current | | 0 to 80mA | ±10% | |
| Tx Power | | | ±3dB | |
| Rx Power | | | ±3dB | |

Pin Definitions

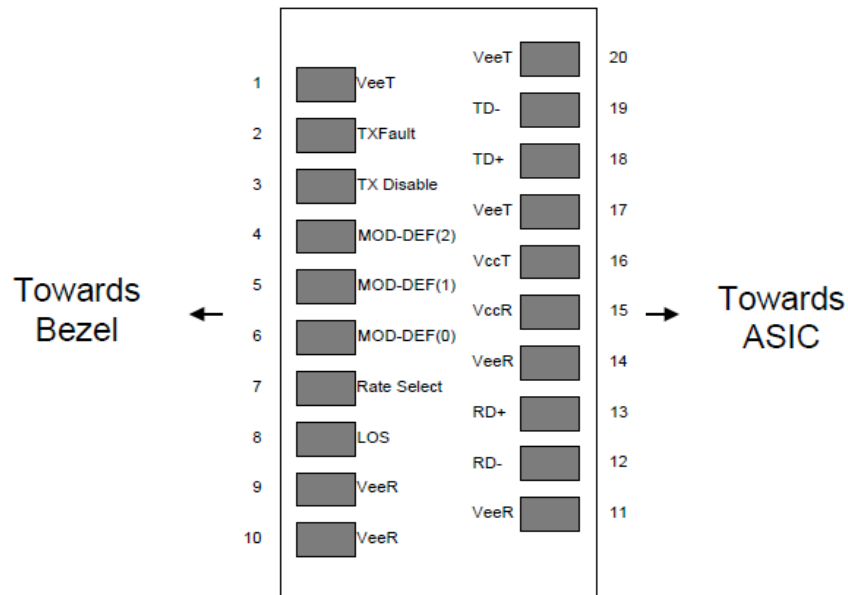


Diagram of Connector Block Pins on Host Board

| Pins | Name | Description | NOTE |
|------|-------------|------------------------------|------|
| 1 | VeeT | Transmitter Ground | |
| 2 | Tx Fault | Transmitter Fault Indication | 1 |
| 3 | Tx Disable | Transmitter Disable | 2 |
| 4 | MOD DEF2 | Module Definition 2 | 3 |
| 5 | MOD DEF1 | Module Definition 1 | 3 |
| 6 | MOD DEF0 | Module Definition 0 | 3 |
| 7 | Rate Select | Not Connected | |
| 8 | LOS | Loss of Signal | 4 |
| 9 | VeeR | Receiver Ground | |
| 10 | VeeR | Receiver Ground | |



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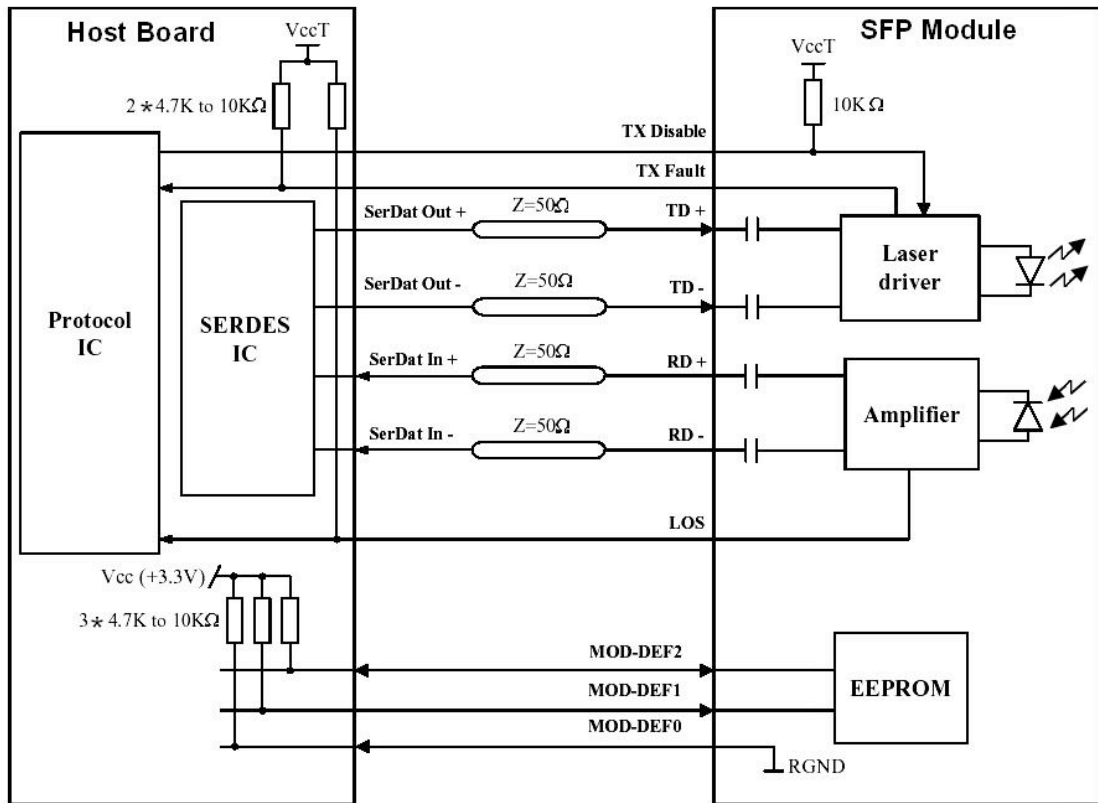
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| | | | |
|----|------|---------------------------|---|
| 11 | VeeR | Receiver Ground | |
| 12 | RD- | Inv. Received Data Output | 5 |
| 13 | RD+ | Received Data Output | 5 |
| 14 | VeeR | Receiver Ground | |
| 15 | VccR | Receiver Power | |
| 16 | VccT | Transmitter Power | |
| 17 | VeeT | Transmitter Ground | |
| 18 | TD+ | Transmit Data Input | 6 |
| 19 | TD- | Inv. Transmit Data Input | 6 |
| 20 | VeeT | Transmitter Ground | |

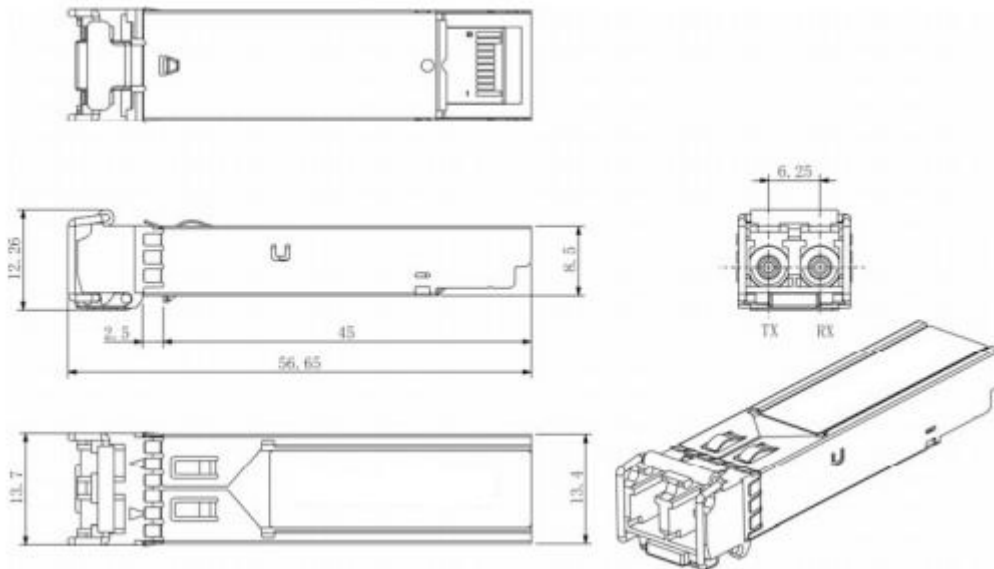
Notes:

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 Vcc+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. TX Disable is an input that is used to shut down the transmitter optical output. It is pulled up within the module with a 4.7k~10kΩ resistor. Its states are:
Low (0~0.8V): Transmitter on
(>0.8V, <2.0V): Undefined
High (2.0~3.3V): Transmitter Disabled
Open: Transmitter Disabled
3. MOD-DEF 0,1,2 are the module definition pins. They should be pulled up with a 4.7k~10kΩ resistor on the host board. The pull-up voltage shall be VccT or VccR.
MOD-DEF 0 is grounded by the module to indicate that the module is present
MOD-DEF 1 is the clock line of two wire serial interface for serial ID
MOD-DEF 2 is the data line of two wire serial interface for serial ID
4. LOS 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 Vcc+0.3V. Logic 0 indicates normal operation; logic 1 indicates loss of signal. In the low state, the output will be pulled to less than 0.8V.
5. These are the differential receiver output. They are internally AC-coupled 100Ω differential lines which should be terminated with 100Ω (differential) at the user SERDES.
6. These are the differential transmitter inputs. They are AC-coupled, differential lines with 100Ω differential termination inside the module.

Recommended Interface Circuit



Mechanical Diagram



Ordering Information

| Part No | Data Rate | Wavelength | Reach | Temp | DDM |
|--------------|-----------|------------|-------|----------|-----|
| OP-2G31-10D | 2.5Gbps | 1310nm | 10KM | 0~70°C | Yes |
| OP-2G31-10ED | 2.5Gbps | 1310nm | 10KM | -10~80°C | Yes |



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| | | | | | |
|--------------|---------|--------|------|----------|-----|
| OP-2G31-10ID | 2.5Gbps | 1310nm | 10KM | -45~85°C | Yes |
|--------------|---------|--------|------|----------|-----|

Warnings

Handling Precautions: This device is susceptible to damage as a result of electrostatic discharge(ESD). A static free environment is highly recommended. Follow guidelines according to proper ESD procedures.

Laser Safety: Radiation emitted by laser devices can be dangerous to human eyes. Avoid eye exposure to direct or indirect radiation.