



Features

- Complaint with IEEE 802.3ae 10GBASE-ER
- Simplex LC connector
- Electrical interface compliant to SFF-8431 specifications
- 1270/1330nm DFB transmitter, APD Receiver, integrated WDM
- 2-wire interface for management specifications compliant with SFF 8472 digital diagnostic
- ROHS compliant

Applications

- High speed storage area networks
- Computer cluster cross-connect
- Custom high-speed data pipes

Absolute Maximum Ratings

| Parameter | Symbol | Min. | Max. | Units | Note |
|----------------------------|-----------|------|------|-------|------|
| Storage Temperature | T_c | -40 | 85 | °C | |
| Operating Case Temperature | T_c | 0 | 70 | °C | |
| Supply Voltage | V_{cc} | 0 | 3.6 | V | |
| Relative Humidity | RH | 5 | 95 | % | |
| RX Input Average Power | P_{max} | --- | -5 | dBm | |

Recommended Operating Conditions

| Parameter | Symbol | Min. | Max. | Units | Note |
|----------------------------|----------|-------|-------|-------|------|
| Case Operating Temperature | T_c | 0 | 70 | °C | |
| Supply Voltage | V_{cc} | 3.135 | 3.465 | V | |
| Supply Current | I_{cc} | --- | 300 | mA | |

Diagnostics Monitoring

| Parameter | Accuracy | Unit | Notes | Calibration |
|--------------|----------|------|----------------------|-------------|
| Temperature | ± 3 | °C | Over operating temp | Internal |
| Voltage | ± 0.1 | V | Full operating range | |
| Bias Current | ± 10% | mA | | |
| TX Power | ± 3 dB | dBm | | |
| RX Power | ± 3 dB | dBm | -1 to 22dBm | |

Transmitter Electro-optical Characteristics

V_{cc} = 3.135 V to 3.465 V, T_c = 0 °C to 70 °C (-40 °C to 85 °C)

| Parameter | Symbol | Min. | Typ. | Max. | Units | Note |
|---|-------------|------|------|------|-------|----------|
| Output Optical Power | P_{out} | -1 | --- | +4 | dBm | 1 |
| Launch power in OMA | OMA | 0 | | +4 | dBm | |
| Center Wavelength | λ_c | 1325 | --- | 1335 | nm | |
| Side mode Suppression Ratio | SMSR | 30 | | | dB | |
| Relative Intensity Noise | RIN | --- | --- | -128 | dB/Hz | |
| OMA minus TDP | | -2.0 | | | dBm | |
| Average launch power of OFF transmitter | P_{OFF} | --- | --- | -30 | dBm | |
| Extinction Ratio | ER | 4.0 | --- | --- | dB | |
| Optical Return Loss Tolerance | RL | 12 | --- | --- | dB | |
| Single Ended Output Voltage Tolerance | | -0.3 | --- | 4 | V | |
| Differential Input Voltage | VI | 180 | --- | 700 | mV | |
| Commonmode voltage tolerance | | 15 | --- | --- | mV | |
| TX Fault | VoL | -0.3 | | 0.4 | V | At 0.7mA |
| Data Dependent Input Jitter | DDJ | | | 0.1 | UI | |
| Data Input Total Jitter | TJ | | | 0.28 | UI | |

Note 1: Average optical power shall be measured using the methods specified in TIA/EIA-455-95.

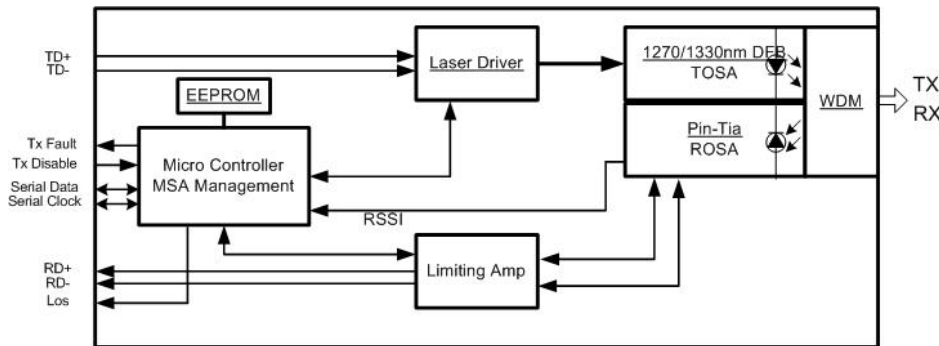
Receiver Electro-optical Characteristics

V_{CC} = 3.135 V to 3.465 V, T_C = 0 °C to 70 °C (-40 °C to 85 °C)

| <i>Parameter</i> | <i>Symbol</i> | <i>Min.</i> | <i>Typ.</i> | <i>Max.</i> | <i>Units</i> | <i>Note</i> |
|---|---------------|-------------|-------------|-------------|--------------|-------------|
| Operating Center Wavelength | λ_c | 1265 | --- | 1275 | nm | |
| Receiver Overload | | -7.0 | --- | | dBm | 1 |
| Receiver Sensitivity in OMA | P_{SEN} | --- | --- | -22 | dB | |
| Receiver Reflectance | R_f | | | -12 | dB | |
| Loss of Signal-Assert | $LOSA$ | -39 | --- | --- | dBm | |
| Loss of Signal-Deasserted | $LOSD$ | --- | --- | -24 | dBm | |
| Loss of Signal-Hysteresis | P_H | 0.5 | --- | --- | | |
| Receive electrical 3dB upper cutoff frequency | | | | 12.3 | GHz | |
| Receiver power (damage) | | | | -5 | dBm | |
| Differential Output Voltage | V_{DIFF} | 300 | --- | 850 | mV | |
| Single Ended Output Voltage Tolerance | | -0.3 | --- | 4 | V | |
| Output Rise and Fall time | T_r/T_f | 30 | | | ps | 20% to 80% |
| Total Jitter | T_J | | | 0.7 | I | |
| Deterministic Jitter | D_J | | | 0.42 | UI | |

Note 1: Average optical power shall be measured using the methods specified in TIA/EIA-455-95.

Block Diagram of Transceiver



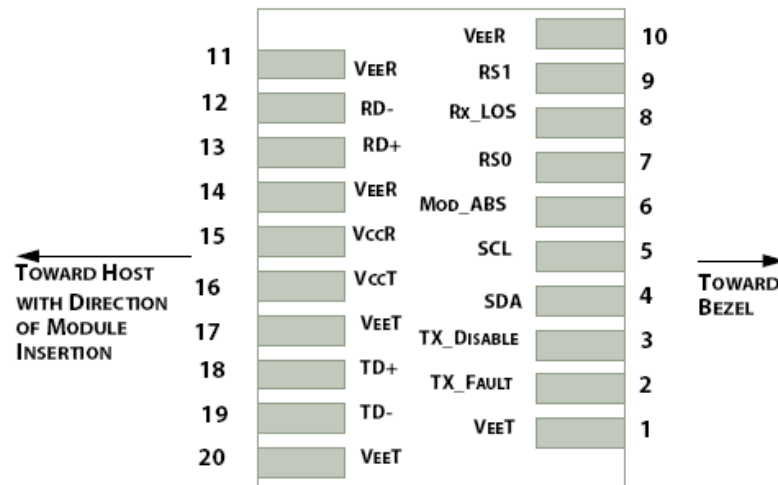
This 10Gigabit SFP+ BiDi transceiver is designed to transmit and receive optical data over single mode optical fiber for link length 40km.

The SFP+ BiDi module electrical interface is compliant to SFI electrical specifications. The transmitter input and receiver output impedance is 100 Ohms differential. Data lines are internally AC coupled. The module provides differential termination and reduce differential to common mode conversion for quality signal termination and low EMI. SFI typically operates over 200 mm of improved FR4 material or up to about 150mm of standard FR4 with one connector.

The transmitter converts 10Gbit/s serial PECL or CML electrical data into serial optical data compliant with the 10GBASE-ER standard. An open collector compatible Transmit Disable (Tx_Dis) is provided. Logic "1" or no connection on this pin will disable the laser from transmitting. Logic "0" on this pin provides normal operation. The transmitter has an internal automatic power control loop (APC) to ensure constant optical power output across supply voltage and temperature variations. An open collector compatible Transmit Fault (Tx_Fault) is provided. TX_Fault is module output contact that when high, indicates that the module transmitter has detected a fault condition related to laser operation or safety. The TX_Fault output contact is an open drain/collector and shall be pulled up to the Vcc_Host in the host with a resistor in the range 4.7-10 kΩ. TX_Disable is a module input contact. When TX_Disable is asserted high or left open, the SFP+ module transmitter output shall be turned off. This contact shall be pulled up to VccT with a 4.7 kΩ to 10 kΩ resistor

The receiver converts 10Gbit/s serial optical data into serial PECL/CML electrical data. An open collector compatible Loss of Signal is provided. Rx_LOS when high indicates an optical signal level below that specified in the relevant standard. The Rx_LOS contact is an open drain/collector output and shall be pulled up to Vcc_Host in the host with a resistor in the range 4.7-10 kΩ, or with an active termination. Power supply filtering is recommended for both the transmitter and receiver. The Rx_LOS signal is intended as a preliminary indication to the system in which the SFP+ is installed that the received signal strength is below the specified range. Such an indication typically points to non-installed cables, broken cables, or a disabled, failing or a powered off transmitter at the far end of the cable.

Pin Assignment

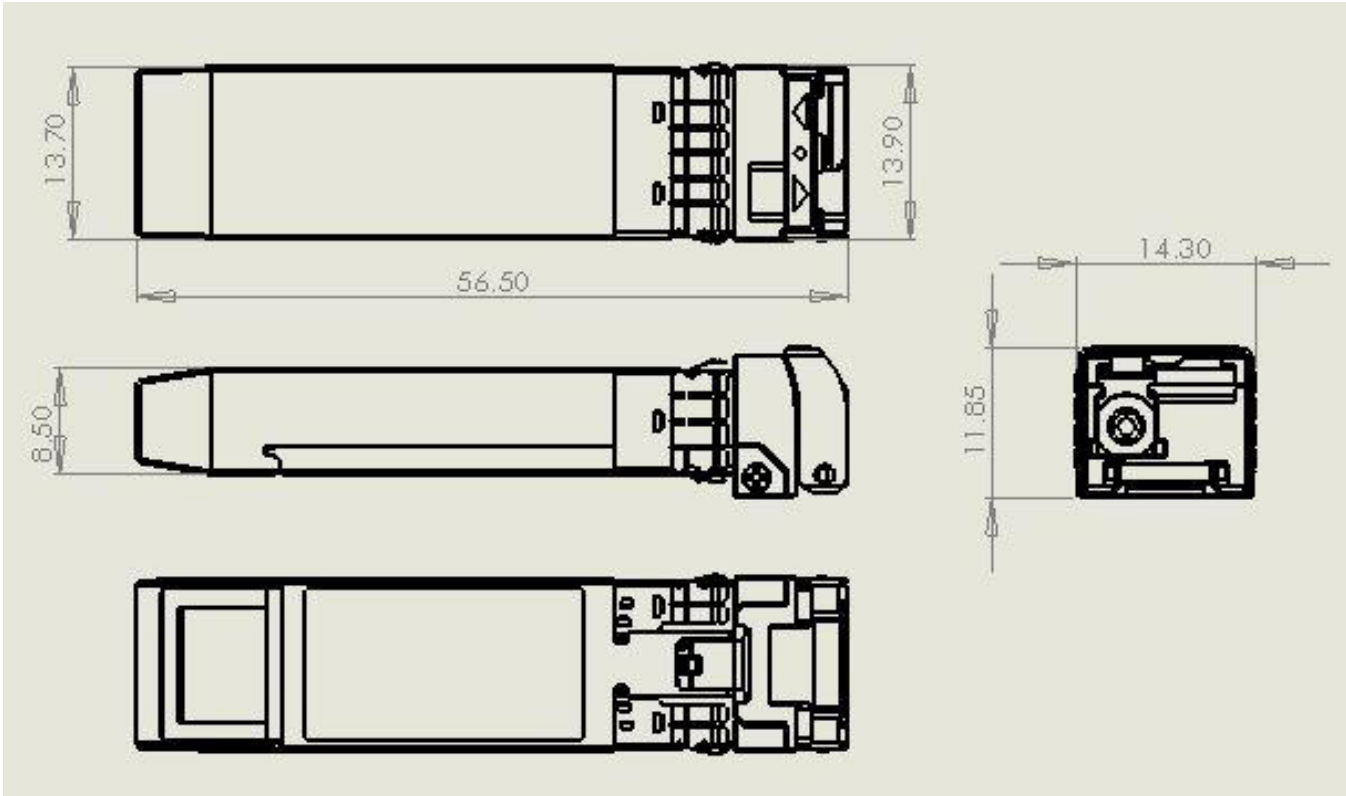


| PIN | Logic | Symbol | Name / Description | Note |
|-----|-----------|----------|---|------|
| 1 | | VeeT | Module Transmitter Ground | 1 |
| 2 | LVTTL-O | TX_Fault | Module Transmitter Fault | |
| 3 | LVTTL-I | TX_Dis | Transmitter Disable; Turns off transmitter laser output | |
| 4 | LVTTL-I/O | SDA | 2-Wire Serial Interface Data Line | 2 |
| 5 | LVTTL-I | SCL | 2-Wire Serial Interface Clock | 2 |
| 6 | | MOD_DEF0 | Module Definition, Grounded in the module | |
| 7 | LVTTL-I | RS0 | Not used | |
| 8 | LVTTL-O | RX_LOS | Receiver Loss of Signal Indication Active High | |
| 9 | LVTTL-I | RS1 | Not used | |
| 10 | | VeeR | Module Receiver Ground | 1 |
| 11 | | VeeR | Module Receiver Ground | 1 |
| 12 | CML-O | RD- | Receiver Inverted Data Output | |
| 13 | CML-O | RD+ | Receiver Data Output | |
| 14 | | VeeR | Module Receiver Ground | 1 |
| 15 | | VccR | Module Receiver 3.3 V Supply | |
| 16 | | VccT | Module Receiver 3.3 V Supply | |
| 17 | | VeeT | Module Transmitter Ground | 1 |
| 18 | CML-I | TD+ | Transmitter Non-Inverted Data Input | |
| 19 | CML-I | TD- | Transmitter Inverted Data Input | |
| 20 | | VeeT | Module Transmitter Ground | 1 |

Note:

1. Module ground pins GND are isolated from the module case.
2. Shall be pulled up with 4.7K-10Kohms to a voltage between 3.15V and 3.45V on the host board.

Dimensions



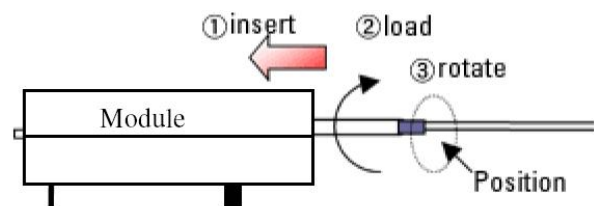
Optical Receptacle Cleaning Recommendations :

All fiber stubs inside the receptacle portions were cleaned before shipment. In the event of contamination of the optical ports, the recommended cleaning process is the use of forced nitrogen. If contamination is thought to have remained, the optical ports can be cleaned using a NTT international Cletop® stick type and HFE7100 cleaning fluid. Before the mating of patch-cord, the fiber end should be cleaned up by using Cletop® cleaning cassette.

Cleaning of patch-cord



Cleaning of fiber stub

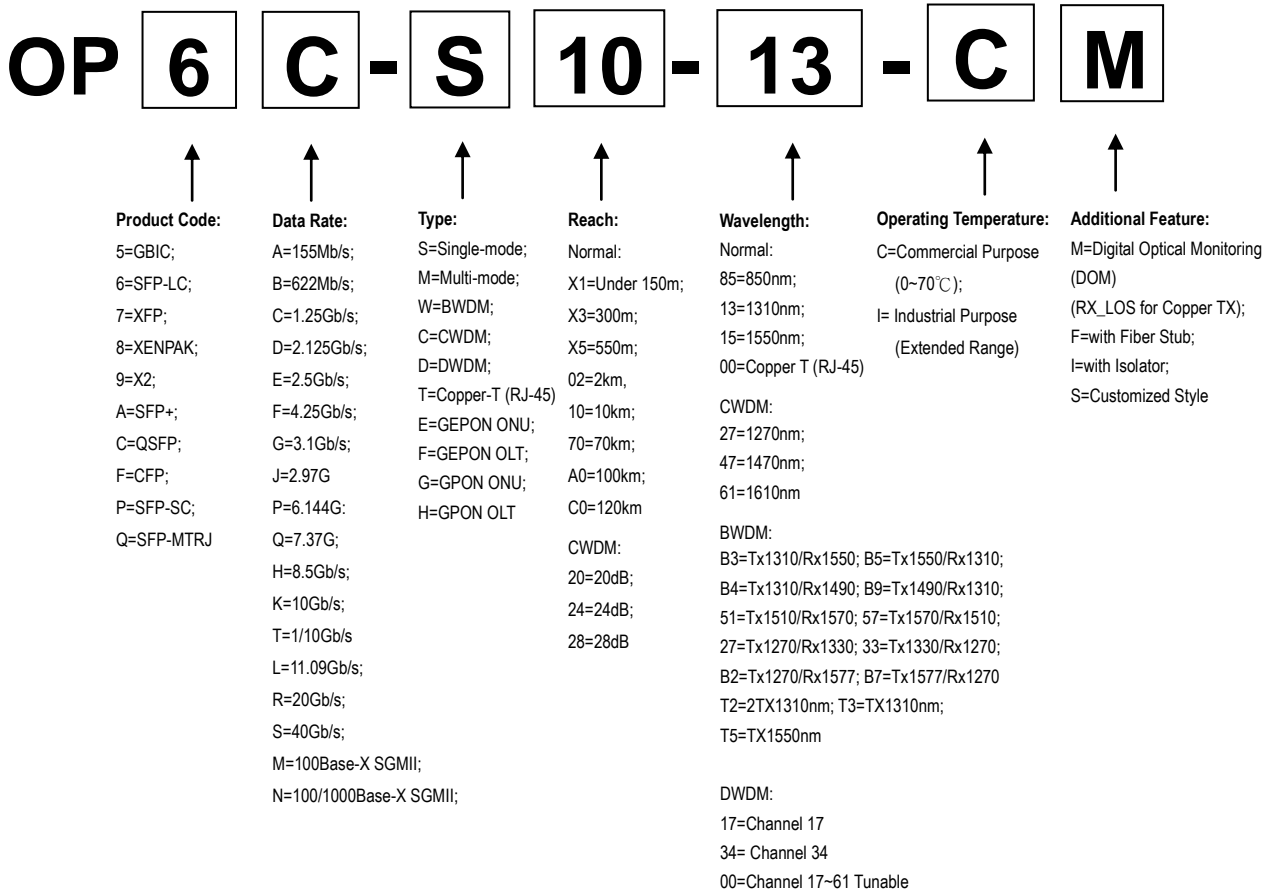


1. Insert
Ensure that stick is held straight when inserting into sleeve.
2. Load
Apply sufficient pressure (approx 600-700g) to ensure ferrule a little depressed in sleeve.
3. Rotate
Rotate stick clockwise 4-5 times, while ensuring direct contact with ferrule end-face is maintained.

*Notice: Number of possible wipes:
Maintenance (repair) ~1 use / piece
Equipment construction: 4 uses / piece (max.)*

Note: The pictures were extracted from NTT-ME website. And the Cletop® is a trademark registered by NTT-ME

Ordering Information



| Model Number | Part Number | Reach | Input/Output | TX/RX | Signal Detect | Voltage | Temperature |
|--------------------|----------------|-------|--------------|-----------|---------------|---------|--------------|
| SFP-10G-BWDM-40-33 | OPAK-W40-33-CB | 40 km | AC/AC | 1330/1270 | TTL | 3.3V | 0°C to 70 °C |

Note: All information contained in this document is subject to change without notice.