

Product Features

- ✧ Dual data-rate of 1.25Gbps/1.063Gbps operation
- ✧ 1550nm DFB laser and PIN photo detector for 80km transmission
- ✧ 1490nm DFB laser and PIN photo detector for 80km transmission
- ✧ BIDI LC/UPC type pluggable optical interface
- ✧ Compliant with SFP MSA and SFF-8472 with simplex LC receptacle
- ✧ RoHS compliant and lead-free
- ✧ Single +3.3V power supply
- ✧ Support Digital Diagnostic Monitoring interface
- ✧ Case operating temperature Commercial: 0°C to +70°C



Applications

- ✧ Gigabit Ethernet
- ✧ Fiber Channel
- ✧ Switch to Switch interface
- ✧ Switched backplane applications
- ✧ Router/Server interface
- ✧ Other Optical Links

Ordering Information

| Part Number | Output Power | Rec. Sens | Data Rate | Wavelength | Distance |
|-----------------------|--------------|-----------|-----------|-----------------|----------|
| <i>FH-SB4512CDL80</i> | -3 ~ 2 db | -28db | 1.25G | TX1490/RX1550nm | 80km |

General

FH-SB4512CDL80 SFP-BIDI transceivers are high performance, cost effective modules supporting dual data-rate of 1.25Gbps/1.0625Gbps and 80km transmission distance with SMF. The transceiver consists of three sections: a DFB 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 (MSA) and SFF-8472. For further information, please refer to SFP MSA.

Absolute Maximum Ratings

| Parameter | Symbol | Min. | Max. | Unit | Note |
|---------------------|--------|------|------|------|------|
| Supply Voltage | Vcc | -0.5 | 4.0 | V | |
| Storage Temperature | Ts | -40 | 85 | °C | |
| Relative Humidity | RH | 0 | 85 | % | |

Note: Stress in excess of the maximum absolute ratings can cause permanent damage to the module

General Operating Characteristics

| Parameter | Symbol | Min. | Typ | Max. | Unit | Note |
|----------------------|------------------|------|------|------|------|------|
| Data Rate | DR | | 1250 | | Gb/s | |
| Supply Voltage | Vcc | 3.13 | 3.3 | 3.47 | V | |
| Supply Current | Icc ₅ | | | 220 | mA | |
| Operating Case Temp. | Tc | 0 | | 70 | °C | |
| Operating Case Temp. | Tl | -40 | | 85 | °C | |

Electrical Input/Output Characteristics

| Parameter | Symbol | Min. | Typ | Max. | Unit | Note |
|----------------------------|--------|------|-----|---------|------|------|
| Transmitter | | | | | | |
| Diff. input voltage swing | | 120 | | 820 | mVpp | 1 |
| Tx Disable input | H | VIH | 2.0 | Vcc+0.3 | V | |
| | L | VIL | 0 | 0.8 | | |
| Tx Fault output | H | VOH | 2.0 | Vcc+0.3 | V | 2 |
| | L | VOL | 0 | 0.8 | | |
| Input Diff. Impedance | Zin | | 100 | | Ω | |
| Receiver | | | | | | |
| Diff. output voltage swing | | 340 | 650 | 800 | mVpp | 3 |
| Rx LOS Output | H | VOH | 2.0 | Vcc+0.3 | V | 2 |
| | L | VOL | 0 | 0.8 | | |

Notes:

1. TD+/- are internally AC coupled with 100Ω differential termination inside the module.
2. Tx Fault and Rx LOS are open collector outputs, which should be pulled up with 4.7k to 10kΩ resistors on the host board. Pull up voltage between 2.0V and Vcc+0.3V.
3. RD+/- outputs are internally AC coupled, and should be terminated with 100Ω (differential) at the user SERDES.

Optical Characteristics

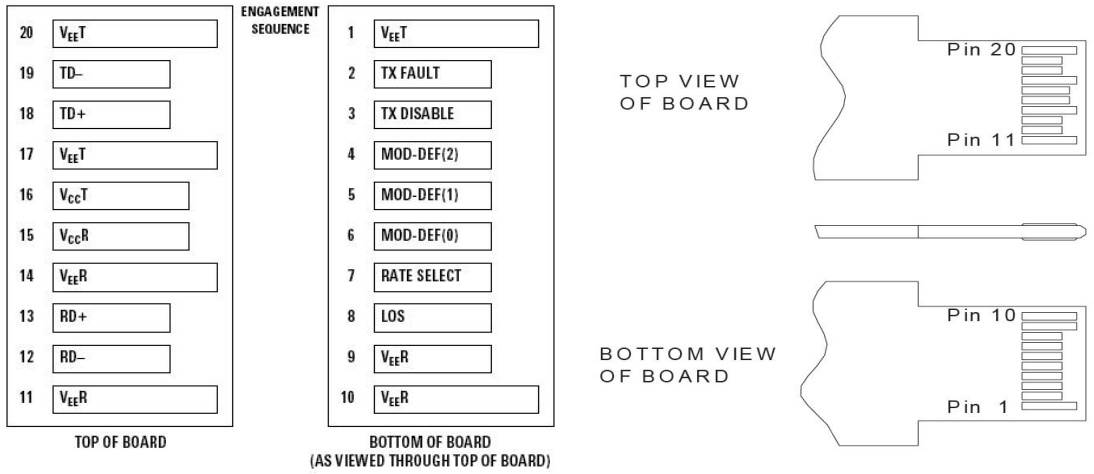
| Parameter | Symbol | Min. | Typ | Max. | Unit | Note |
|-----------------------------|--|------|------|------|------|------|
| Transmitter | | | | | | |
| Operating Wavelength | λ | 1470 | 1490 | 1510 | nm | |
| Ave. output power (Enabled) | P _{AVE} | -3 | | 2 | dBm | 1 |
| Extinction Ratio | ER | 9 | | | dB | 1 |
| RMS spectral width | $\Delta\lambda$ | | | 4 | nm | |
| Rise/Fall time (20%~80%) | T _r /T _f | | | 0.26 | ns | 2 |
| Dispersion penalty | T _{DP} | | | 3.9 | dB | |
| Output Optical Eye | Compliant with IEEE802.3 z (class 1 aser safety) | | | | | |

| Receiver | | | | | | |
|----------------------|-----------|------|------|------|-----|---|
| Operating Wavelength | λ | 1530 | 1550 | 1570 | nm | |
| Receiver Sensitivity | PSEN1 | | | -28 | dBm | 3 |
| Overload | PAVE | -3 | | | dBm | |
| LOS Assert | Pa | -40 | | | dBm | |
| LOS De-assert | Pd | | | -29 | dBm | 4 |
| LOS Hysteresis | Pd-Pa | 0.5 | | 6 | dB | |

Notes:

1. Measured at 1250Mb/s with PRBS $2^{23}-1$ NRZ test pattern.
2. Unfiltered, measured with a PRBS $2^{23}-1$ test pattern @1.25Gbps
3. Measured at 1250Mb/s with PRBS $2^{23}-1$ NRZ test pattern for BER < 1×10^{-12}
4. When LOS de-asserted, the RX data+/- output is signal output.

Pin Definitions And Functions



| Pin | Symbol | Name/Description | Notes |
|-----|-------------------|--|-------|
| 1 | V _{EE} T | Tx ground | |
| 2 | Tx Fault | Tx fault indication, Open Collector Output, active "H" | 1 |
| 3 | Tx Disable | LVTTTL Input, internal pull-up, Tx disabled on "H" | 2 |
| 4 | MOD-DEF2 | 2 wire serial interface data input/output (SDA) | 3 |
| 5 | MOD-DEF1 | 2 wire serial interface clock input (SCL) | 3 |
| 6 | MOD-DEF0 | Model present indication | 3 |
| 7 | Rate select | No connection | |

| | | | |
|----|------|--|---|
| 8 | LOS | Rx loss of signal, Open Collector Output, active “H” | 4 |
| 9 | VeeR | Rx ground | |
| 10 | VeeR | Rx ground | |
| 11 | VeeR | Rx ground | |
| 12 | RD- | Inverse received data out | 5 |
| 13 | RD+ | Received data out | 5 |
| 14 | VeeR | Rx ground | |
| 15 | VccR | Rx power supply | |
| 16 | VccT | Tx power supply | |
| 17 | VeeT | Tx ground | |
| 18 | TD+ | Transmit data in | 6 |
| 19 | TD- | Inverse transmit data in | 6 |
| 20 | VeeT | Tx ground | |

Notes:

1. When high, this output indicates a laser fault of some kind. Low indicates normal operation. And should be pulled up with a 4.7 – 10K Ω resistor on the host board.

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 4.7 – 10K Ω resistor. Its states are:

Low (0 – 0.8V): Transmitter on ($>0.8, <2.0V$): Undefined
High (2.0V~Vcc+0.3V): Transmitter Disabled Open: Transmitter Disabled

3. Mod-Def 0,1,2. These are the module definition pins. They should be pulled up with a 4.7K – 10K Ω resistor on the host board. The pull-up voltage shall be between 2.0V~Vcc+0.3V.

Mod-Def 0 has been 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. When high, this output indicates loss of signal (LOS). Low indicates normal operation.

5. RD+/-: These are the differential receiver outputs. They are AC coupled 100 Ω differential lines which should be terminated with 100 Ω (differential) at the user SERDES. The AC coupling is done inside the module and is thus not required on the host board.

6. TD+/-: These are the differential transmitter inputs. They are AC-coupled, differential lines with 100 Ω differential termination inside the module. The AC coupling is done inside the module and is thus not required on the host board.

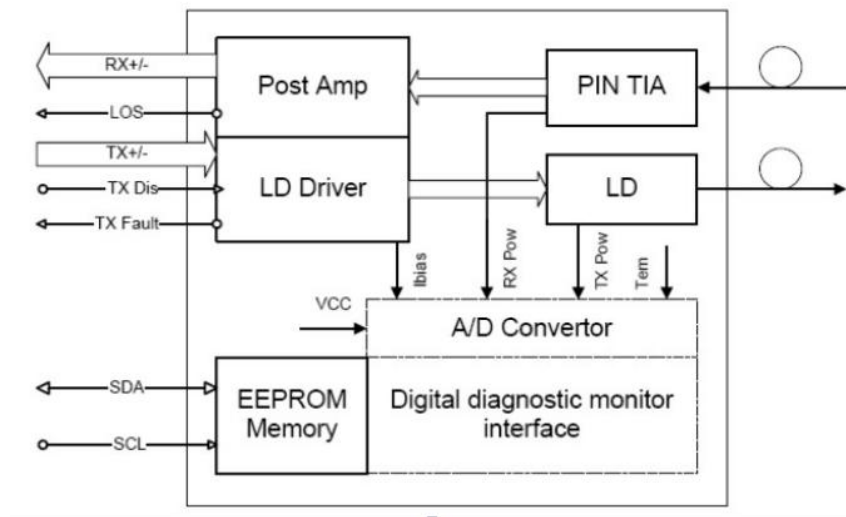
Diagnostics

| Parameter | Symbol | Units | Min. | Max. | Accuracy | Note |
|------------------------------|-----------|-------|------|------|----------|------|
| Transceiver temperature | DTemp-E | °C | -45 | +90 | ±5°C | 1 |
| Transceiver supply voltage | DVoltage | V | 2.8 | 4.0 | ±3% | |
| Transmitter bias current | DBias | mA | 2 | 80 | ±10% | 2 |
| Transmitter output power | DTx-Power | dBm | -3 | +8 | ±3dB | |
| Receiver average input power | DRx-Power | dBm | -35 | 0 | ±3dB | |

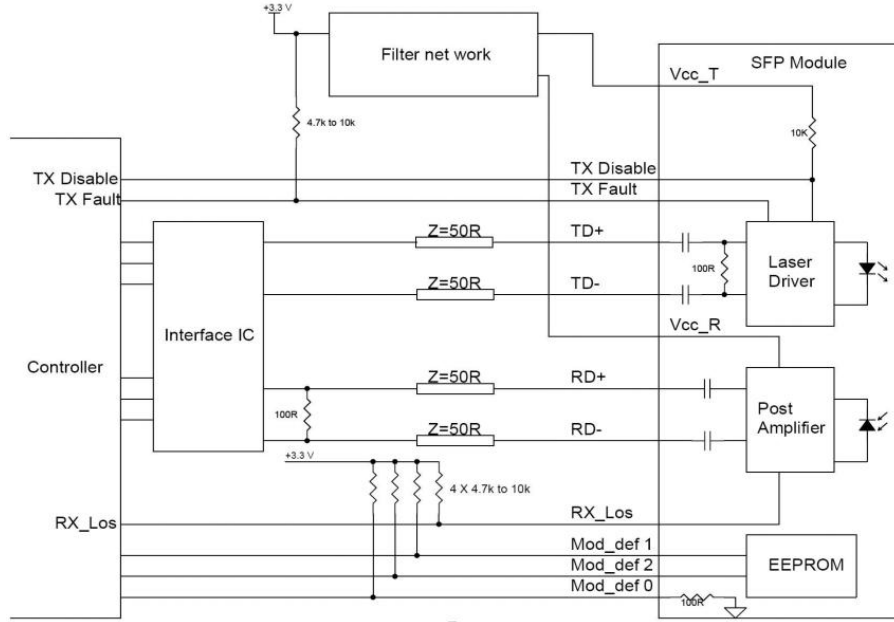
Notes:

1. When Operating temp.=0~70 °C, the range will be min=-5, Max=+75
2. The accuracy of the Tx bias current is 10% of the actual current from the laser driver to the laser
3. Internal/ External Calibration compatible.

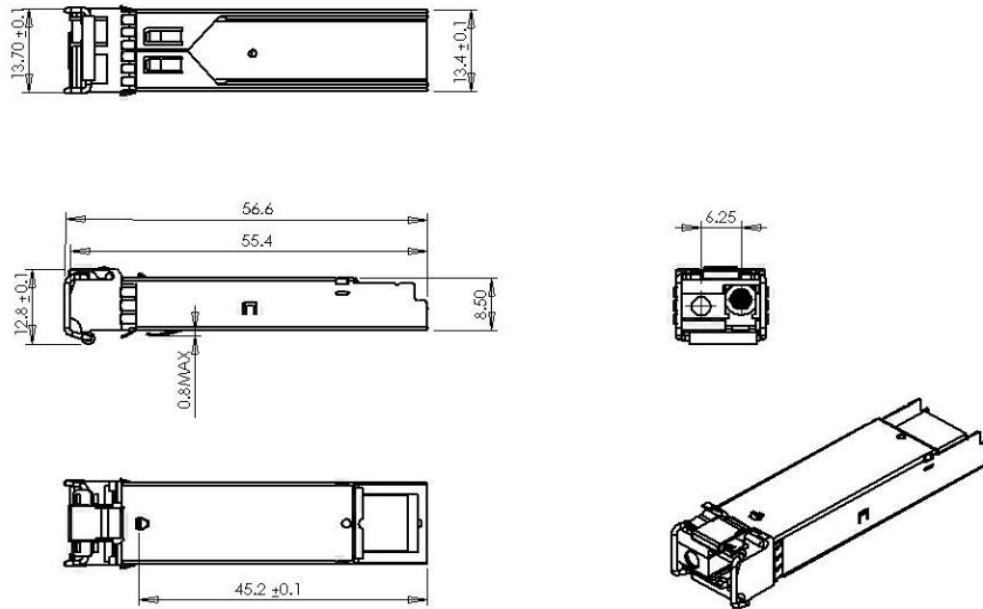
Functional Diagram



Typical Interface Circuit



Package Dimensions



For More Information

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