

Features



- Built-in PHY supporting SGMII Interface
- 100BASE-FX operation
- 1310nm FP laser and PIN photo-detector
- 0.5m~2km transmission with MMF
- Standard serial ID information Compatible with SFP MSA
- SFP MSA package with duplex LC connector
- With Spring-Latch for high density application
- Very low EMI and excellent ESD protection
- +3.3V single power supply
- Operating case temperature: -5 to +70°C

Regulatory Compliance

Table 1 - Regulatory Compliance

| Feature | Standard | Performance |
|---|--|--|
| Electrostatic Discharge (ESD) to the Electrical Pins | MIL-STD-883E Method 3015.7 | Class 1(>500 V) |
| Electrostatic Discharge (ESD) to the Duplex LC Receptacle | IEC 61000-4-2 GR-1089-CORE | Compatible with standards |
| Electromagnetic Interference (EMI) | FCC Part 15 Class B EN55022 Class B (CISPR 22B) VCCI Class B | Compatible with standards |
| Immunity | IEC 61000-4-3 | Compatible with standards |
| Laser Eye Safety | FDA 21CFR 1040.10 and 1040.11 EN60950, EN (IEC) 60825-1,2 | Compatible with Class I laser product. |
| Component Recognition | UL and CSA | Compatible with standards |
| RoHS | 2002/95/EC 4.1&4.2 2005/747/EC | Compliant with standards ^{note} |

Note:

In light of item 5 in Annex of 2002/95/EC, "Pb in the glass of cathode ray tubes, electronic components and fluorescent tubes." and item 13 in Annex of 2005/747/EC, "Lead and cadmium in optical and filter glass.", the two exemptions are being concerned for Source Photonics's transceivers, because Source Photonics's transceivers use glass, which may contain Pb, for components such as lenses, windows, isolators, and other electronic components.

Absolute Maximum Ratings

Table 2 - Absolute Maximum Ratings

| Parameter | Symbol | Min. | Typical | Max. | Unit | Notes |
|-----------------------------|----------|------|---------|------|------|-------|
| Storage Temperature | T_s | -40 | - | +85 | °C | |
| Supply Voltage | V_{CC} | -0.5 | - | +3.6 | V | |
| Operating Relative Humidity | RH | 5 | - | +95 | % | |
| Power consumption | | | | 1.2 | W | |

Recommended Operating Conditions

Table 3 – Recommended Operating Conditions

| Parameter | Symbol | Min. | Typical | Max. | Unit | Notes |
|----------------------------|----------|------|---------|------|------|-------|
| Operating Case Temperature | T_C | -5 | - | +70 | °C | |
| Power Supply Voltage | V_{CC} | 3.10 | 3.3 | 3.50 | V | |
| Power Supply Current | I_{CC} | - | - | 320 | mA | 1 |
| Date Rate | | | 125 | | Mbps | |

Note 1: The max. power supply current after module work stable.

Optical Characteristics

Table 4 – Optical Characteristics

| Transmitter | | | | | | |
|-------------------------------|---------------------------------|------|---------|-------|------|-------|
| Parameter | Symbol | Min. | Typical | Max. | Unit | Notes |
| Centre Wavelength | λ_C | 1270 | 1310 | 1355 | nm | |
| Average Output Power | P_{Out} | -20 | | -14 | dBm | 1 |
| $P_{Out}@TX$ Disable Asserted | P_{Out} | | | -45 | dBm | 1 |
| Spectral Width (RMS) | σ | | | 7.7 | nm | |
| Extinction Ratio | EX | 9 | | | dB | |
| Rise/Fall Time (20%~80%) | t_r/t_f | | | 3 | ns | 2 |
| Output Optical Eye | Compatible with IEEE 802.3-2002 | | | | | 3 |
| Receiver | | | | | | |
| Centre Wavelength | λ_C | 1260 | 1310 | 1570 | nm | |
| Receiver Sensitivity | | | | -31.5 | dBm | 4 |
| Receiver Overload | | -8 | | | dBm | 4 |
| Return Loss | | 12 | | | dB | |

| | | | | | | |
|--|------------------|-----|--|-------|-----|--|
| LOS De-Assert | LOS _D | | | -32.5 | dBm | |
| LOS Assert | LOS _A | -45 | | | dBm | |
| LOS Hysteresis | | 0.5 | | 4.5 | dB | |
| Total Jitter (SGMII Series Interface) | T _J | | | 0.43 | UI | |

Notes:

1. The optical power is launched into 62.5/125um MMF.
2. Unfiltered, measured with 4B/5B code for 125Mbps
3. Measured with 4B/5B code for 125Mbps.
4. Measured with 4B/5B code for 125Mbps, worst-case extinction ratio, BER $\leq 1 \times 10^{-10}$.

Electrical Characteristics

Table 5 – Electrical Characteristics

| Transmitter | | | | | | |
|--|------------------|------|-----------------|----------------------|------|-------|
| Parameter | Symbol | Min. | Typical | Max. | Unit | Notes |
| Data Input Swing Differential (SGMII Series interface) | V _{IN} | 500 | | 1200 | mV | 1 |
| Input Differential Impedance | Z _{IN} | 80 | 100 | 120 | Ω | |
| TX Disable | Disable | | 2.0 | V _{cc} | V | |
| | Enable | | V _{ee} | V _{ee} +0.8 | | |
| TX Fault | Fault | | 2.0 | V _{cc} | V | |
| | Normal | | V _{ee} | V _{ee} +0.5 | | |
| Receiver | | | | | | |
| Data Output Swing Differential (SGMII Series Interface) | V _{OUT} | 370 | | 2000 | mV | 1 |
| LOS | High | | 2.0 | V _{cc} +0.3 | V | |
| | Low | | V _{ee} | V _{ee} +0.5 | | |

Notes:

1. PECL logic, internally AC coupled.

Recommended Host Board Power Supply Circuit

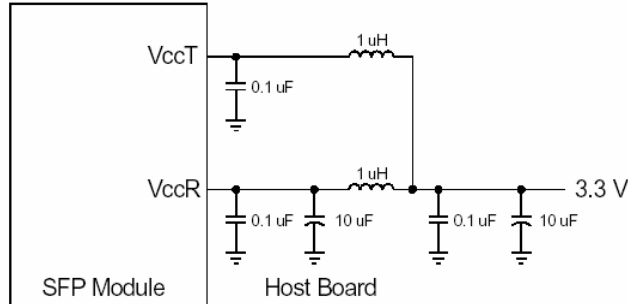


Figure 1, Recommended Host Board Power Supply Circuit

Recommended Interface Circuit

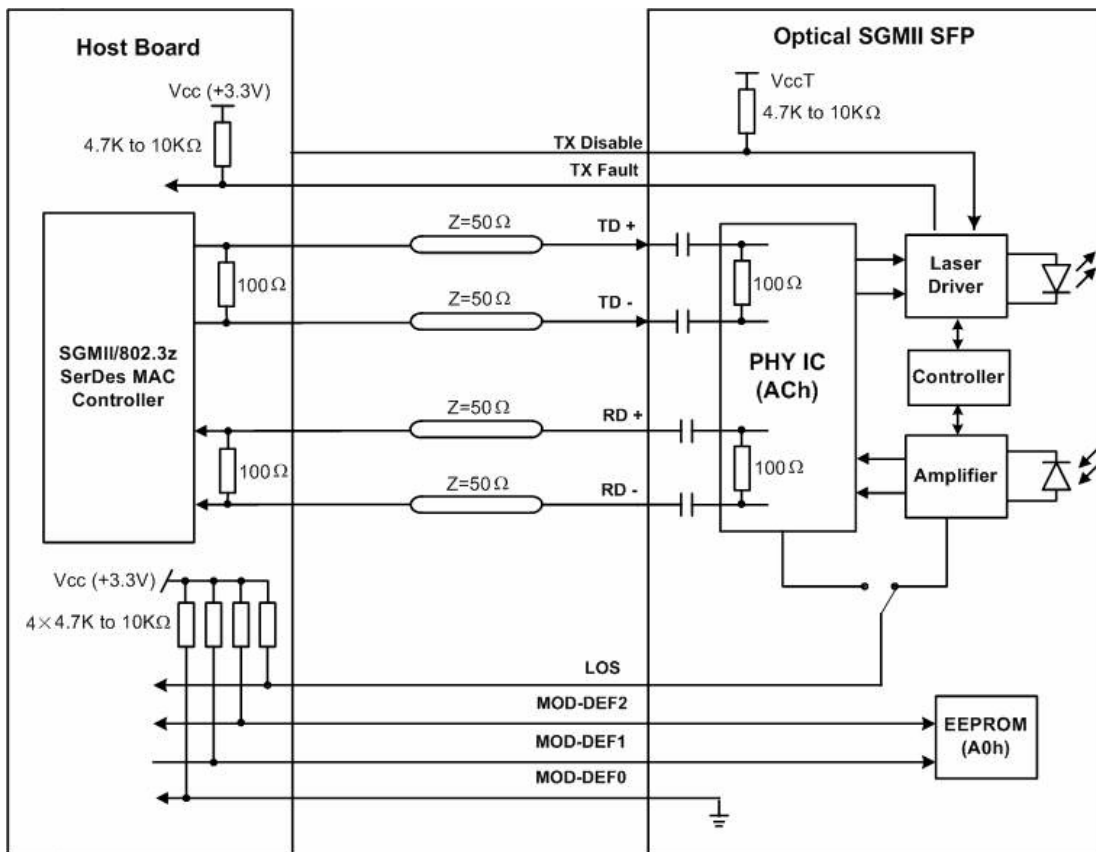


Figure 2, Recommended Interface Circuit

Pin Definitions

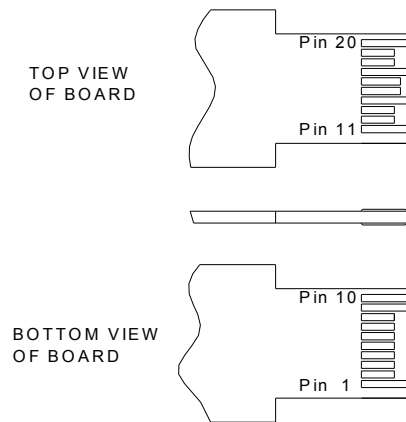


Figure 3, Pin View

Table 6–Pin Function Definitions

| Pin No. | Name | Function | Plug Seq. | Notes |
|---------|-------------|----------------------------------|-----------|--------|
| 1 | VeeT | Transmitter Ground | 1 | |
| 2 | TX Fault | Transmitter Fault Indication | 3 | Note 1 |
| 3 | TX Disable | Transmitter Disable | 3 | Note 2 |
| 4 | MOD-DEF2 | Module Definition 2 | 3 | Note 3 |
| 5 | MOD-DEF1 | Module Definition 1 | 3 | Note 3 |
| 6 | MOD-DEF0 | Module Definition 0 | 3 | Note 3 |
| 7 | Rate Select | 100Base-FX/1000Base-LX selection | 3 | Note 7 |
| 8 | LOS | Loss of Signal | 3 | Note 4 |
| 9 | VeeR | Receiver Ground | 1 | |
| 10 | VeeR | Receiver Ground | 1 | |
| 11 | VeeR | Receiver Ground | 1 | |
| 12 | RD- | Inv. Received Data Out | 3 | Note 5 |
| 13 | RD+ | Received Data Out | 3 | Note 5 |
| 14 | VeeR | Receiver Ground | 1 | |
| 15 | VccR | Receiver Power | 2 | |
| 16 | VccT | Transmitter Power | 2 | |
| 17 | VeeT | Transmitter Ground | 1 | |
| 18 | TD+ | Transmit Data In | 3 | Note 6 |
| 19 | TD- | Inv. Transmit Data In | 3 | Note 6 |
| 20 | VeeT | Transmitter Ground | 1 | |

Notes:

- 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 (2.0~3.465V): | 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 or link down with partner I. 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 host with SGMII interface.
6. These are the differential transmitter inputs. They are AC-coupled, differential lines with 100Ω differential termination inside the module.
7. When hardware rate selection has higher priority than software configuration via I2C, this pin can be used to select bit rate by host hardware.

EEPROM Information

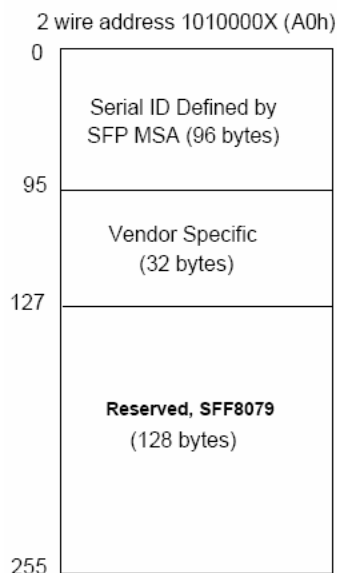


Figure 4, 2-wire Serial Digital Diagnostic Memory Map

Table 7 –EEPROM Serial ID Memory Contents (A0h)

| 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 | 00 00 00 20 00 00 00 00 | 100BASE-FX |
| 11 | 1 | Encoding | 02 | 4B5B |
| 12 | 1 | BR, nominal | 01 | 100Mbps |
| 13 | 1 | Reserved | 00 | |
| 14 | 1 | Length (9um)-km | 00 | |
| 15 | 1 | Length (9um) | 00 | |
| 16 | 1 | Length (50um) | C8 | 2km |
| 17 | 1 | Length (62.5um) | C8 | 2km |
| 18 | 1 | Length (copper) | 00 | |
| 19 | 1 | Reserved | 00 | |
| 20—35 | 16 | Vendor name | 53 4F 55 52 43 45 50 48 4F 54 4F 4E 49 43 53 20 | “SOURCEPHOTONICS”(ASC II) |
| 36 | 1 | Reserved | 00 | |
| 37—39 | 3 | Vendor OUI | 00 00 00 | |
| 40—55 | 16 | Vendor PN | 53 50 47 46 45 46 58 43 4E 46 42 20 20 20 20 20 | “SPGFEXCNFB”(ASC II) |
| 56—59 | 4 | Vendor rev | 31 30 20 20 | ASC II (“31 30 20 20” means 1.0 revision) |
| 60-61 | 2 | Wavelength | 05 1E | 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 (2 bytes), Month (2 bytes), Day (2 bytes) |
| 92 | 1 | Reserved | 00 | |
| 93 | 1 | Reserved | 00 | |
| 94 | 1 | Reserved | 00 | |
| 95 | 1 | CC_EXT | xx | Check sum of bytes 64 - 94 |
| 96—154 | 58 | Vendor specific | | |
| 155 | 1 | Reserved | | Read only |
| 156-247 | | Vendor specific | | |
| 248 | 1 | Status | | Read only |

| | | | | |
|-----|---|----------|--|--------------------------|
| 249 | 1 | CFG0 | | Work mode configuration |
| 250 | 1 | CFG1 | | Work mode configuration |
| 251 | 1 | CFG2 | | Work mode configuration |
| 252 | 1 | Status | | Module status indication |
| 253 | 1 | Reserved | | Read only |
| 254 | 1 | PSWH | | Password entry |
| 255 | 1 | PSWL | | Password entry |

Mechanical Diagram

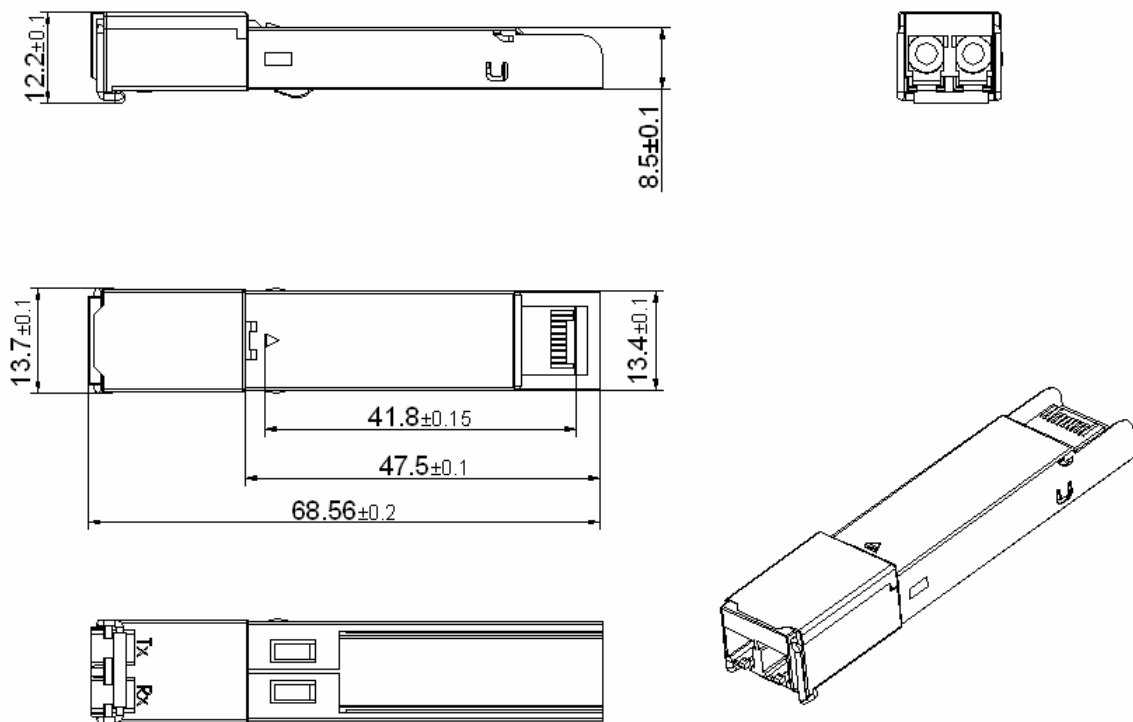


Figure 5, Mechanical Diagram of SFP+

Order Information

Table 8 – Order Information

| Part No. | Media | Data Rate(Mbps) | Transmission Distance(km) | Temperature |
|----------------|-------|-----------------|---------------------------|-------------|
| SPG-FE-FX-CNFB | MMF | 125 | 2 | -5~+70°C |

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.

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