

Features

- ☞ Up to 155Mbps data rate
- ☞ Single SC receptacle optical interface compliant
- ☞ Single +3.3V power supply
- ☞ DDM function implemented, External calibration
- ☞ Hot-pluggable
- ☞ Receiver Loss of Signal Output
- ☞ AC coupling of PECL signals
- ☞ Serial ID module on MOD(0-2)
- ☞ International Class 1 laser safety certified
- ☞ Transmitter disable input
- ☞ Operating temperature range: -40°C ~ +85°C
- ☞ RoHS Compliance



Applications

- ☞ Fast Ethernet
- ☞ SDH/STM-1,SONET/OC-3
- ☞ Metropolitan area network
- ☞ Other optic link

Standards

- ☞ Compliant with SFP MSA (INF-8074i)
- ☞ Compliant with SFF-8472 v9.5
- ☞ Compliant with ITU-T G.957 STM-1

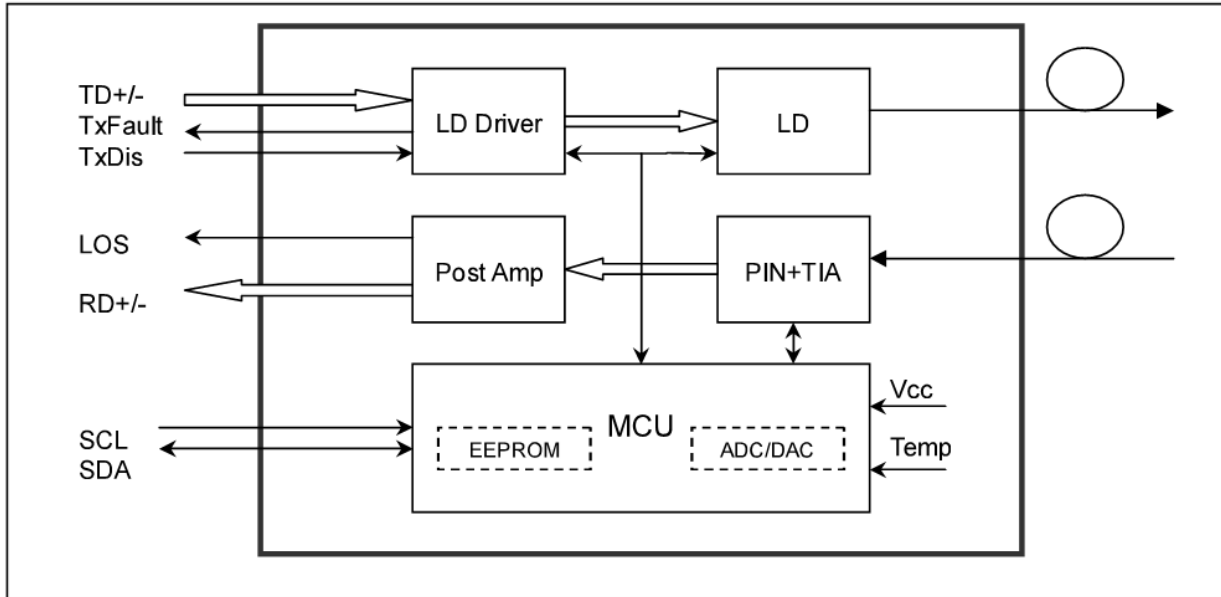
Description

The SFP transceiver is high performance, cost effective module supporting 155Mbps and 20km transmission distance with SMF(9/125μm).

The transceiver consists of two sections: a 1310nm FP laser transmitter, a PIN photodiode integrated with a trans-impedance amplifier (TIA). The transceiver satisfies class1 laser safety requirements.

The transceiver is compatible with SFP Multi-Source Agreement (MSA) and SFF-8472. For further information, please refer to SFP MSA.

Module Block Diagram



Absolute Maximum Ratings

| Parameter | Symbol | Min | Max | Unit |
|---------------------------|--------|------|-----|------|
| Power Supply Voltage | Vcc | -0.5 | 4 | V |
| Storage Temperature Range | Ts | -40 | 85 | °C |
| Relative Humidity | RH | 5 | 95 | % |

Recommended Operating Conditions

| Parameter | Symbol | Min | Typical | Max | Unit |
|----------------------------------|--------------------|------|---------|------|------|
| Case Operating Temperature Range | Tc | -40 | | 85 | °C |
| Power Supply Voltage | Vcc | 3.14 | 3.3 | 3.47 | V |
| Supply Current | I _{TX+RX} | | | 300 | mA |
| Differential Input Voltage | V _{IN} | 400 | | 2000 | mV |
| Differential output Voltage | V _{OUT} | 600 | 800 | | mV |
| Data Rate | | | 155.52 | | Mbps |

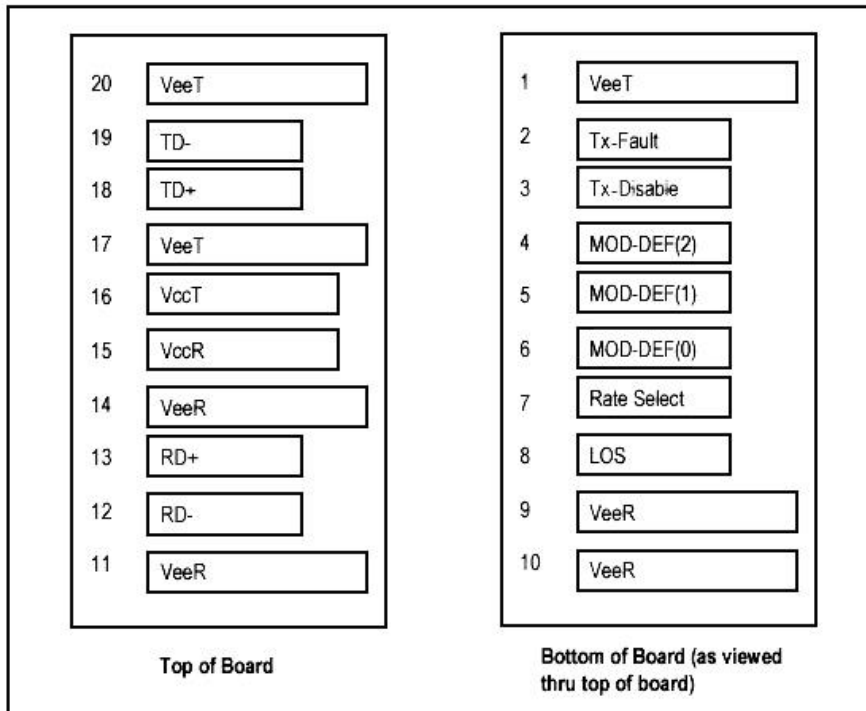
Optical and Electrical Characteristics

| Parameter | Symbol | Min | Typical | Max | Unit | Notes |
|------------------------------------|---|------|---------|------|-------|------------|
| Transmitter Characteristics | | | | | | |
| Center Wavelength Range | λ_c | 1260 | 1310 | 1360 | nm | FP-LD |
| | | 1530 | 1550 | 1580 | | |
| Spectral Width | $\Delta\lambda$ | | | 4 | nm | FP-LD |
| Launch Optical Power | Pout | -15 | | -8 | dBm | 20km FP-LD |
| Extinction Ratio | EX | 10 | | | dB | |
| Transmitter jitter | TJ | | | 0.1 | Ulp-p | 1 |
| Relative Intensity Noise | RIN | | | -120 | dB/Hz | 2 |
| Eye Diagram | Complies with ITU-T G.957 STM-1 eye masks when filtered | | | | | |
| Optical Rise/Fall Time | Trise/Tfall | | | 3 | ns | 3 |
| Receiver Characteristics | | | | | | |
| Receiver Sensitivity | S | | | -32 | dBm | 4 |
| Receiver Overload | Pin | -8 | | | dBm | |
| Loss of Signal-Asserted | LOS-A | -45 | | | dBm | |
| Loss of Signal-Deasserted | LOS-D | | | -32 | dBm | |
| LOS Hysteresis | | 0.5 | 3 | 5 | dB | 5 |

Notes:

1. For the jitter measurements, the device was driven with SONET OC-3 data pattern with 2²³-1 PBRS payload
2. RIN is the laser noise, integrated over a specified bandwidth, measured relative to average optical power with 12dB return loss. For multimode application, the RIN is better than -117dB/Hz.
3. Optical transition time is the time interval required for the rising or falling edge of an optical pulse to transition between the 20% and 80% amplitudes relative to the logical 1 and 0 levels.
4. Measured with a PRBS 2²³-1 test pattern, @155Mb/s, EX=10dB, BER<10⁻¹⁰.
5. The LOS Hysteresis to minimize "chatter" on the output line. In principle, Hysteresis alone does not guarantee chatter-free operation.

Pin Definitions



Pin Descriptions

| Pin | Signal Name | Description | Plug Seq. | Notes |
|-----|-------------|------------------------------|-----------|-------|
| 1 | VeeT | Transmitter Ground | 1 | |
| 2 | Tx_Fault | Transmitter Fault Indication | 3 | 1 |
| 3 | Tx_Disable | Transmitter Disable | 3 | 2 |
| 4 | MOD_DEF(2) | SDA Serial Data Signal | 3 | 3 |
| 5 | MOD_DEF(1) | SCL Serial Clock Signal | 3 | 3 |
| 6 | MOD_DEF(0) | TTL Low | 3 | 3 |
| 7 | Rate Select | Not Connected | 3 | |
| 8 | LOS | Loss of Signal | 3 | 4 |
| 9 | VeeR | Receiver ground | 1 | |
| 10 | VeeR | Receiver ground | 1 | |
| 11 | VeeR | Receiver ground | 1 | |
| 12 | RD- | Inv. Received Data Out | 3 | 5 |
| 13 | RD+ | Received Data Out | 3 | 5 |
| 14 | VeeR | Receiver ground | 1 | |
| 15 | VccR | Receiver Power Supply | 2 | |
| 16 | VccT | Transmitter Power Supply | 2 | |
| 17 | VeeT | Transmitter Ground | 1 | |
| 18 | TD+ | Transmit Data In | 3 | 6 |
| 19 | TD- | Inv. Transmit Data In | 3 | 6 |
| 20 | VeeT | Transmitter Ground | 1 | |

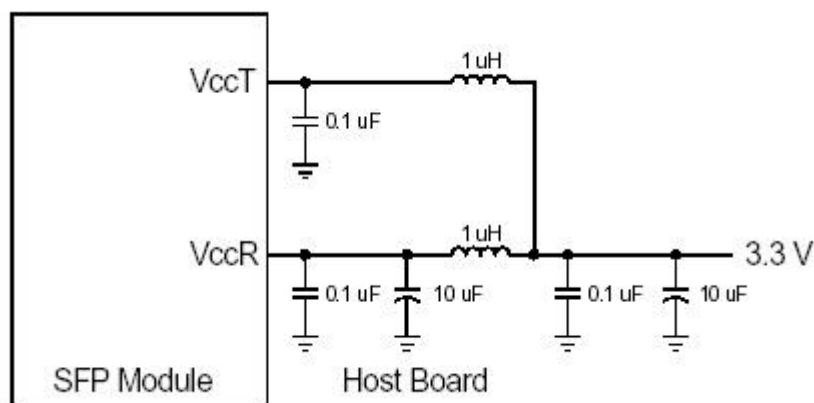
Notes:

1. Tx Fault is open collector output which should be pulled up with a 4.7kΩ~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 input is used to shut down the transmitter optical output. It is pulled up within the module with a 4.7kΩ~10kΩ resistor. Its states are:

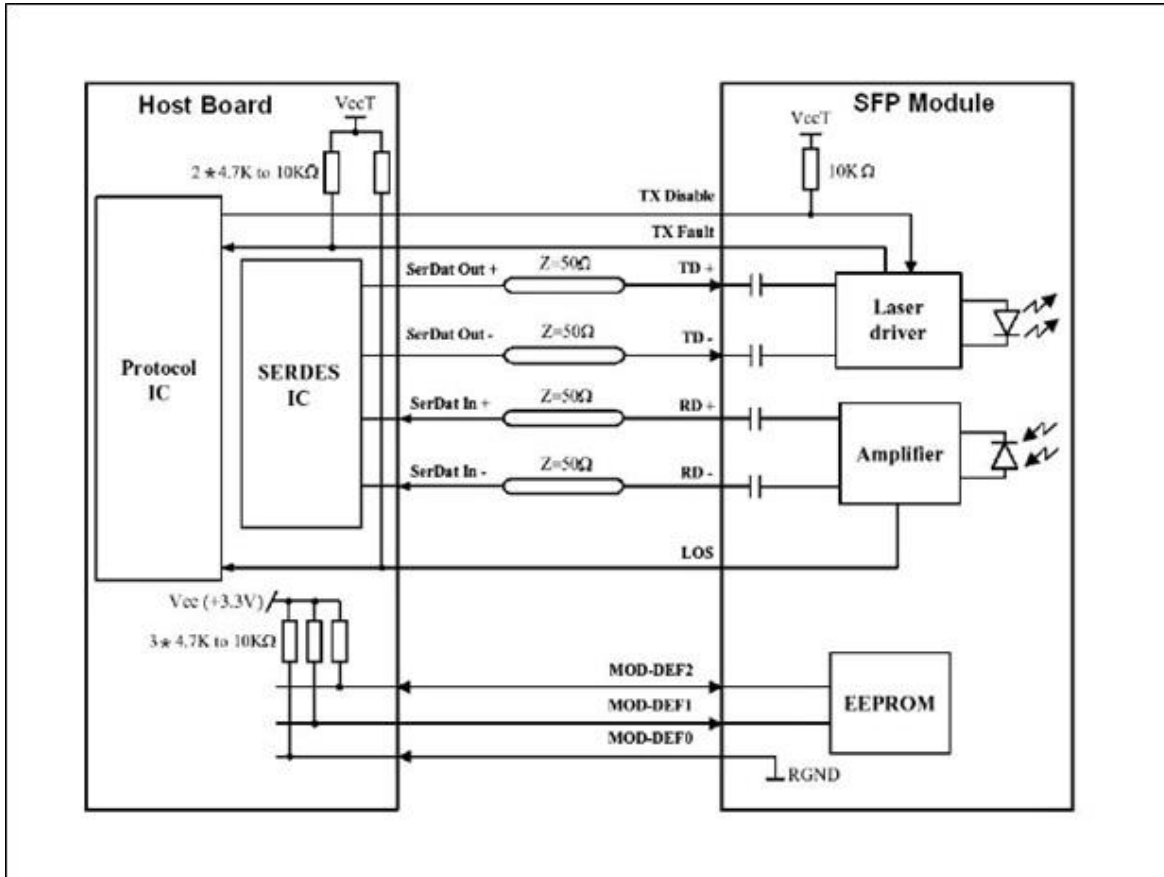
| | |
|--------------------------|----------------------|
| Low (0 to 0.8V): | Transmitter on |
| Between (>0.8V, < 2.0V): | Undefined |
| High (2.0 to 3.47V): | Transmitter Disabled |
| Open: | Transmitter Disabled |
3. Mod-Def 0,1,2. These are the module definition pins. They should be pulled up with a 4.7kΩ~10kΩ resistor on the host board to supply less than VccT+0.3V or VccR+0.3V.
 - 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 4.7kΩ~10kΩ resistor. Pull up voltage between 2.0V and Vcc+0.3V. Logic 1 indicates loss of signal; Logic 0 indicates normal operation. In the low state, the output will be pulled to less than 0.8V.
5. RD-/+ : These are the differential receiver outputs. They are internally AC-coupled 100Ω differential lines which should be terminated with 100Ω (differential) at the user SERDES.
6. TD-/+ : These are the differential transmitter inputs. They are internally AC-coupled differential lines with 100Ω differential termination inside the module. The AC-coupling is done inside the module and is thus not required on host board.

Recommended Host Board Supply Filtering Circuit

The MSA power supply noise rejection filter is required on the host PCB to meet data sheet performance. The MSA filter incorporates an inductor which should be rated 400mA DC and 1Ω serial resistance or better. It should not be replaced with a ferrite. The required filter is illustrated in Figure. The MSA also specifies that 4.7K to 10KΩ pull-up resistors for Tx Fault, LOS, and MOD_DEF(0,1,2) are required on the host PCB. Figure is the suggested transceiver/host interface.



Recommended Interface Circuit



Digital Diagnostic Memory Map

2 wire address 1010000X (A0h)

| | |
|-----|---|
| 0 | Serial ID Defined by SFP MSA (96 bytes) |
| 95 | |
| 127 | Vendor Specific (32 bytes) |
| 255 | Reserved in SFP MSA (128 bytes) |

2 wire address 1010001X (A2h)

| | |
|-----|---|
| 0 | Alarm and Warning Thresholds (56 bytes) |
| 95 | |
| 119 | Cal Constants (24 bytes) |
| 127 | Real Time Diagnostic Interface (24 bytes) |
| 127 | Vendor Specific (8 bytes) |
| 247 | User Writable EEPROM (120 bytes) |
| 255 | Vendor Specific (8 bytes) |

I²C Read/Write Memory Contents (A0h) Information

Accessing Serial ID Memory use the 2 wire address 1010000x (A0). Memory contents of Serial ID are shown in the below table.

| Address | Size (Bytes) | Name of Field | Contents (Hex) | Description |
|---------|--------------|-------------------|-------------------------|--|
| 0 | 1 | Identifier | 03 | SFP |
| 1 | 1 | Ext. Identifier | 04 | SFP function is defined by serial ID only |
| 2 | 1 | Connector | | SC Connector |
| 3-10 | 8 | Transceiver | | Transceiver Codes |
| 11 | 1 | Encoding | 03 | NRZ |
| 12 | 1 | BR, nominal | 01 | 155Mbps |
| 13 | 1 | Reserved | 00 | |
| 14 | 1 | Length (9um)-km | 14 | Transmit distance is 20km |
| 15 | 1 | Length (9um)-100m | Xx | |
| 16 | 1 | Length (50um) | 00 | |
| 17 | 1 | Length (62.5um) | 00 | |
| 18 | 1 | Length (copper) | 00 | |
| 19 | 1 | Length (OM3) | 00 | |
| 20-35 | 16 | Vendor name | xxx | Company Name (ASC II) "Honlus" |
| 36 | 1 | Reserved | 00 | |
| 37-39 | 3 | Vendor OUI | 00 00 00 | |
| 40-55 | 16 | Vendor PN | xxx | Transceiver product number (ASC II) |
| 56-59 | 4 | Vendor rev | | 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 | Check Sum (variable) | Check code for base ID fields |
| 64-65 | 2 | Options | 00 1A | Tx_Disable, Tx_Fault and Loss of Signal implemented |
| 66 | 1 | BR, max | 00 | |
| 67 | 1 | BR, min | 00 | |
| 68-83 | 16 | Vendor SN | | Serial Number (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 | Diagnostic type | 58 | Diagnostics (External Calibrated) |
| 93 | 1 | Enhanced option | B0 | Diagnostics (Optional alarm/warning flags, Soft TX_FAULT and Soft TX_LOS monitoring) |

| | | | | |
|--------|-----|-----------------|----------------------|---|
| 94 | 1 | SFF-8472 | 02 | Diagnostics (SFF-8472 Rev 9.5) |
| 95 | 1 | CC EXT | Check Sum (variable) | Check sum of bytes 64-94 for extended ID fields |
| 96-255 | 160 | Vendor specific | | |

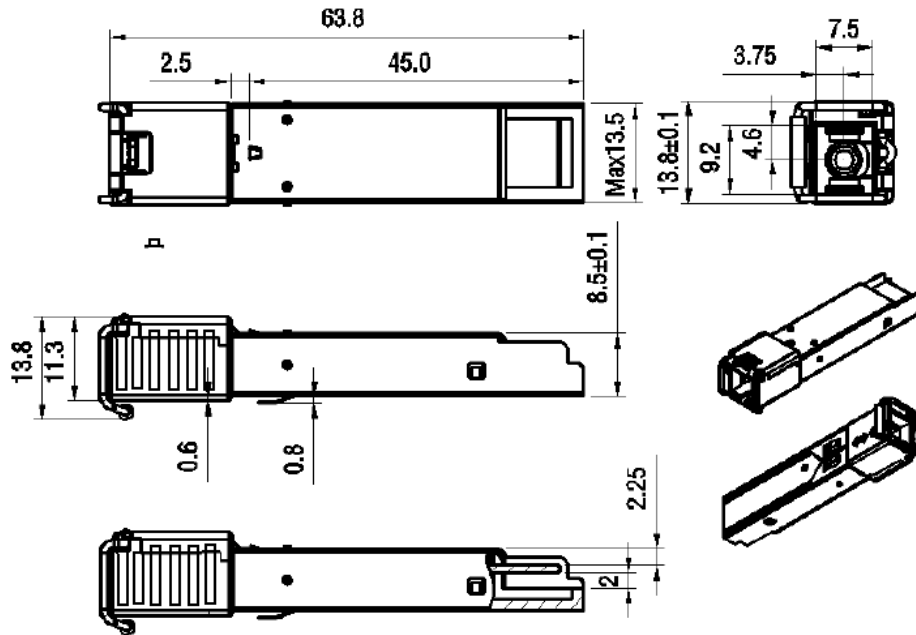
I²C Read/Write Memory Contents (A2h) Monitoring Interface

Diagnostic Monitor Functions interface use the 2 wire address 1010001x (A2). Memory contents of diagnostic monitor functions are shown in the below table.

| Address | Size (Bytes) | Name of Field | Description |
|-----------------------|--------------|-----------------------------|--|
| 00-01 | 2 | Temperature High Alarm | Temperature set to 100°C |
| 02-03 | 2 | Temperature Low Alarm | Temperature set to -45°C |
| 04-05 | 2 | Temperature High Warning | Temperature set to 85°C |
| 06-07 | 2 | Temperature Low Warning | Temperature set to -40°C |
| 08-09 | 2 | Vcc High Alarm | Set to 3.6V |
| 10-11 | 2 | Vcc Low Alarm | Set to 3.0V |
| 12-13 | 2 | Vcc High Warning | Set to 3.5V |
| 14-15 | 2 | Vcc Low Warning | Set to 3.1V |
| 16-17 | 2 | Bias High Alarm | 2xIBias(25°C)+20 |
| 18-19 | 2 | Bias Low Alarm | 25%xIBias(25°C) |
| 20-21 | 2 | Bias High Warning | 2xIBias(25°C)+10 |
| 22-23 | 2 | Bias Low Warning | 50%xIBias(25°C) |
| 24-25 | 2 | TX Power High Alarm | Manufacture measurement plus 2dB |
| 26-27 | 2 | TX Power Low Alarm | Manufacture measurement minus 2dB |
| 28-29 | 2 | TX Power High Warning | Manufacture measurement plus 1.5dB |
| 30-31 | 2 | TX Power Low Warning | Manufacture measurement minus 1.5dB |
| 32-33 | 2 | RX Power High Alarm | Maximum input optical power |
| 34-35 | 2 | RX Power Low Alarm | Minimum input optical power |
| 36-37 | 2 | RX Power High Warning | Maximum input optical power minus 3dB |
| 38-39 | 2 | RX Power Low Warning | Minimum input optical power plus 3dB |
| 40-55 | 16 | Reserved | |
| Calibration Constants | | | |
| 56-59 | 4 | RX Power Calibration Data 4 | Single precision floating-point number |
| 60-63 | 4 | RX Power Calibration Data 3 | |
| 64-67 | 4 | RX Power Calibration Data 2 | |
| 68-71 | 4 | RX Power Calibration Data 1 | |
| 72-75 | 4 | RX Power Calibration Data 0 | |
| 76-77 | 2 | Bias Calibration Data 1 | 00 01 (fixed) |
| 78-79 | 2 | Bias Calibration Data 0 | 00 00 (fixed) |
| 80-81 | 2 | TX Power Calibration Data 1 | 00 01 (fixed) |

| | | | |
|--|-----|--------------------------------|---|
| 82-83 | 2 | TX Power Calibration Data 0 | 00 00 (fixed) |
| 84-85 | 2 | Temperature Calibration Data 1 | 00 01 (fixed) |
| 86-87 | 2 | Temperature Calibration Data 0 | 00 00 (fixed) |
| 88-89 | 2 | Vcc Calibration Data 1 | 00 01 (fixed) |
| 90-91 | 2 | Vcc Calibration Data 0 | 00 00 (fixed) |
| 92-94 | 3 | Reserved | |
| 95 | 1 | Check Sum | Checksum of bytes 0-94 |
| Real Time Diagnostic Monitor Interface | | | |
| 96 | 1 | Measured Temperature MSB | Internally measured transceiver temperature. Compliant with external calibration of SFF-8472 |
| 97 | 1 | Measured Temperature LSB | |
| 98 | 1 | Measured Vcc MSB | Internally measured transceiver supply voltage Vcc. Compliant with external calibration of SFF-8472 |
| 99 | 1 | Measured Vcc LSB | |
| 100 | 1 | Measured LD Bias MSB | Measured transceiver LD bias current. Compliant with external calibration of SFF-8472 |
| 101 | 1 | Measured LD Bias LSB | |
| 102 | 1 | Measured TX Power MSB | Measured transceiver TX power. Compliant with external calibration of SFF-8472 |
| 103 | 1 | Measured TX Power LSB | |
| 104 | 1 | Measured RX Power MSB | Measured transceiver RX power. Compliant with external calibration of SFF-8472 |
| 105 | 1 | Measured RX Power LSB | |
| 106-109 | 4 | Reserved | |
| 110 | 1 | Logic Status | |
| 111 | 1 | AD Conversion | |
| 112-119 | 8 | Alarm and Warning Flags | |
| Vendor Specific | | | |
| 120-127 | 8 | Vendor Specific | Don't Access |
| 128-247 | 120 | User writable EEPROM | |
| 248-255 | 8 | Vendor Specific | Don't Access |

Mechanical Dimensions



Ordering information

| Part Number | Product Description |
|------------------|--|
| HOLS-P1352-SD-IF | Tx/Rx 1310nm/1550nm, 155Mbps, SM 20km, -40°C~+85°C, With DDM |
| HOLS-P1532-SD-IF | Tx/Rx 1550nm/1310nm, 155Mbps, SM 20km, -40°C~+85°C, With DDM |

Regulatory Compliance

Honlus' SFP transceiver is designed to be Class 1 Laser safety compliant and is certified per the following standards

| Feature | Agency | Standard |
|---------|---------|---|
| | ISO9001 | GB/T 19001-2008/ISO 9001:2008 |
| Safety | TUV | EN 60950-1:2006+A11+A1+A12+A2 |
| EMC | CE | EN 55022: 1998 + A1: 2000 + A2: 2003 |
| | | EN 61000 – 4 – 2: 1995 + A1: 1998 + A2: 2001 |
| | | EN 61000 – 4 – 3: 2002 + A1: 2002 |
| RoHS | TUV | RoHS Directive 2011/65/EC |
| EMI | FCC | FCC Rules and Regulations Part 15 Subpart B Class B |