

1184560P6-A
2GBASE, SFP, OC-48, SR Transceiver

Features

- Operating Data Rate up to 2.5Gbps
- 1310nm FP Laser Transmitter
- 2km with 9/125 μ m SMF
- Single 3.3V Power Supply
- Hot-Pluggable SFP Footprint Duplex LC Connector Interface
- Class 1 FDA and IEC60825-1 Laser Safety Compliant
- Operating Temperature: -40°C ~ +85°C
- Compliant with MSA SFP Specification
- Compliant with SFF-8472

1. Description

Approved Networks 1184560P6-A SFP SR Transceiver is a high performance, cost effective module which have a duplex LC optics interface. Standard AC coupled CML for high speed signal and LVTTTL control and monitor signals. The receiver section uses a PIN receiver and the transmitter uses a 1310 nm FP laser, up to 15dB link budge ensure this module 2GB Ethernet 2km application.



Applications

- Gigabit Ethernet Interface
- FC/2XFC Optical Interface
- STM1/STM4/STM6 Optical Interface
- Other Optical Links

2. Absolute Maximum Ratings

Operation in excess of any absolute maximum ratings might cause permanent damage to this module.

| Parameter | Symbol | Min | Typ | Max | Units |
|----------------------|--------|------|-----|-----|-------|
| Storage Temperature | TS | -40 | | +85 | °C |
| Power Supply Voltage | VCC | -0.5 | | 4 | V |
| Relative Humidity | RH | 0 | | 95 | % |

3. Recommended Operating Environment

| Parameter | Symbol | Min | Typ | Max | Unit |
|---|--------|------|-------|------|------|
| Case operating Temperature (Industrial) | TC | -40 | | 85 | °C |
| Supply Voltage | VCC | 3.15 | 3.3 | 3.45 | V |
| Supply Current | Icc | | | 300 | mA |
| Data Rate | | | 2.488 | | Gbps |

4. Electrical Characteristics

| Parameter | Sym | Min. | Typ. | Max | Unit | Notes |
|---------------------------------|---------|-------|------|------|---------|----------------------------|
| Transmitter | | | | | | |
| CML Inputs(Differential) | Vin | 400 | | 1600 | mVpp | AC Coupled Inputs*(Note1) |
| Input Impedance (Differential) | Zin | 85 | 100 | 115 | ohms | Rin > 100 kohms@ DC |
| TX_Disable Assert Time | t_off | | | 10 | us | |
| TX_Dis | Disable | | 2 | | Vcc+0.3 | |
| | Enable | | | 0 | 0.8 | |
| TX_FAULT | Fault | | 2 | | Vcc+0.3 | V |
| | Normal | | 0 | | 0.8 | |
| Receiver | | | | | | |
| CML Outputs (Differential) | Vout | 400 8 | 00 | 1200 | mVpp | AC Coupled Outputs*(Note1) |
| Output Impedance (Differential) | Zout | 85 | 100 | 115 | ohms | |
| RX_LOS | LOS | | 2 | | Vcc+0.3 | V |
| | Normal | | 0 | | 0.8 | |
| MOD_DEF(0.2) | VoH | 2.5 | | | V | With Serial ID |
| | Vol | 0 | | 0.5 | | |

5. Optical and Electrical Characteristics

| Parameter | Symbol | Min | Typ | Max | Unit |
|---------------------------------|-----------------------|------|-------|------|------|
| 9µm Core Diameter SMF | L | | 2 | | km |
| Data Rate | | | 2.488 | | Gbps |
| Transmitter Section: | | | | | |
| Parameter | Symbol | Min | Typ | Max | Unit |
| Center Wavelength | λ_c | 1260 | 1310 | 1360 | nm |
| Spectral Width | σ | | | 3 | nm |
| Optical Output Power | Pout | -10 | | -3 | dBm |
| Extinction Ratio | ER | 8.2 | | | dB |
| TX_Disable ASSERT | tr/tf | | | 150 | ps |
| Total Jitter ^(Note3) | TJ | | | 0.07 | UI |
| Pout @ TX Disable Asserted | Pout | | | -45 | dBm |
| Output Optical Eye | ITU-T G.957 Compliant | | | | |
| Receiver Section: | | | | | |
| Parameter | Symbol | Min | Typ | Max | Unit |
| Optical Input Wavelength | λ_c | 1260 | | 1600 | nm |
| Receiver Overload | Pol | -3 | | | dBm |
| RX Sensitivity | Sen | | | -24 | dBm |
| RX_LOS Assert | LOS A | -35 | | | dBm |
| RX_LOS De-assert | LOS D | | | -19 | dBm |
| RX_LOS Hysteresis | LOS H | 0.5 | | | dB |

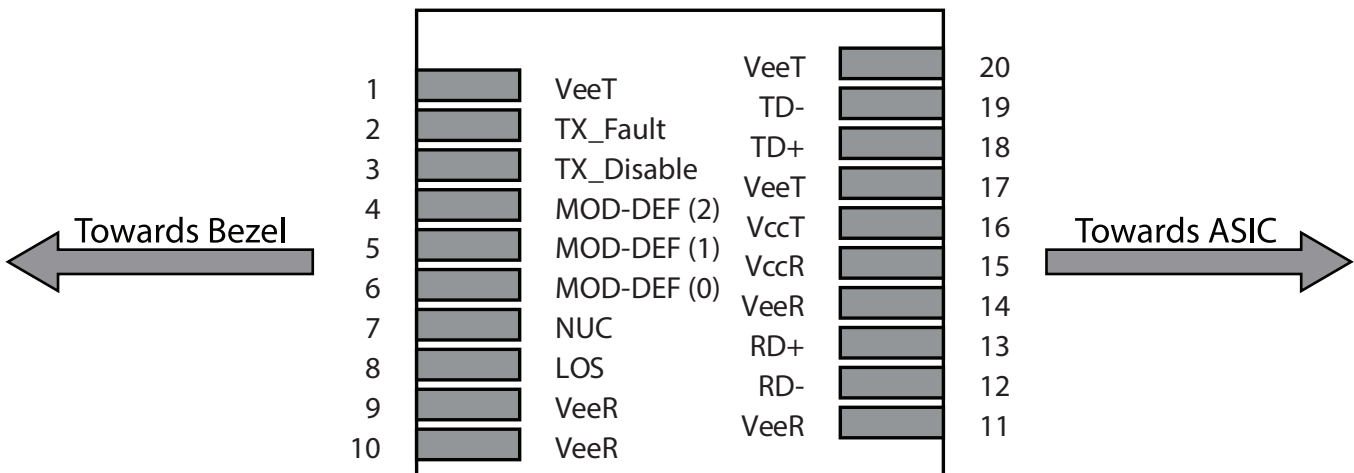
Notes:

1. LVPECL logic, internally AC coupled
2. Output power is measured by coupling into a 9/125 mm multi-mode fiber.
3. Filtered, measured with a PRBS 223-1 test pattern @2500Mbps.
4. Minimum average optical power is measured at BER less than 1E-12, with 2²³-1 PRBS and ER=9 dB

6. Regulatory Compliance

| Feature | Standard | Performance |
|--|---|---|
| Electrostatic Discharge (ESD) to the Electrical Pins | MIL-STD-883G Method 3015.7 | Class 1C (>1000V) |
| Electrostatic Discharge to the enclosure | EN 55024:1998+A1+A2 IEC-61000-4-2 GR-1089-CORE | Compliant with standards |
| Electromagnetic Interference (EMI) | FCC Part 15 Class B EN55032:2012 CISPR 22B :2006 VCCI Class B | Compliant with standards Noise frequency range: 0.15MHz to 6GHz. Good system EMI design practice required to achieve Class B margins. System margins are dependent on customer host board and chassis design. |
| Immunity | EN 55024:1998+A1+A2 IEC 61000-4-3 | Compliant with standards. 1KHz sine-wave, 80% AM, from 80MHz to 1GHz. No effect on transmitter/receiver performance is detectable between these limits. |
| Component Recognition | UL and CUL EN60950-1:2006 | UL file E317337 TÜV Certificate No. 50135086(CB scheme) |
| RoHS6 | 2002/95/EC 4.1&4.2 2005/747/EC 5&7&13 | Compliant with standards |

7. Pin Assignment and Description



8. Pin Function Definitions

| Pin No | Name | Function | Plug Seq | Notes |
|--------|-------------|------------------------------|----------|-------|
| 1 | VeeT | Transmitter Ground | 1 | 5 |
| 2 | TX Fault | Transmitter Fault Indication | 3 | 1 |
| 3 | TX Disable | Transmitter Disable | 3 | 2 |
| 4 | MOD-DEF2 | Module Definition | 2 | 3 |
| 5 | MOD-DEF1 | Module Definition 1 | 3 | 3 |
| 6 | MOD-DEF0 | Module Definition 0 | 3 | 3 |
| 7 | Rate Select | Not Connected | 3 | N/A |
| 8 | LOS | Loss of Signal | 3 | 4 |
| 9 | VeeR | Receiver Ground | 1 | 5 |
| 10 | VeeR | Receiver Ground | 1 | 5 |
| 11 | VeeR | Receiver Ground | 1 | 5 |
| 12 | RD- | Inv. Received Data Out | 3 | 6 |
| 13 | RD+ | Received Data Out | 3 | 7 |
| 14 | VeeR | Receiver Ground | 3 | 5 |
| 15 | VccR | Receiver Power | 2 | 7 |
| 16 | VccT | Transmitter Power | 2 | 7 |
| 17 | VeeT | Transmitter Ground | 1 | 5 |
| 18 | TD+ | Transmit Data In | 3 | 8 |
| 19 | TD- | Inv. Transmit In | 3 | 8 |
| 20 | VeeT | Transmitter Ground | 1 | 5 |

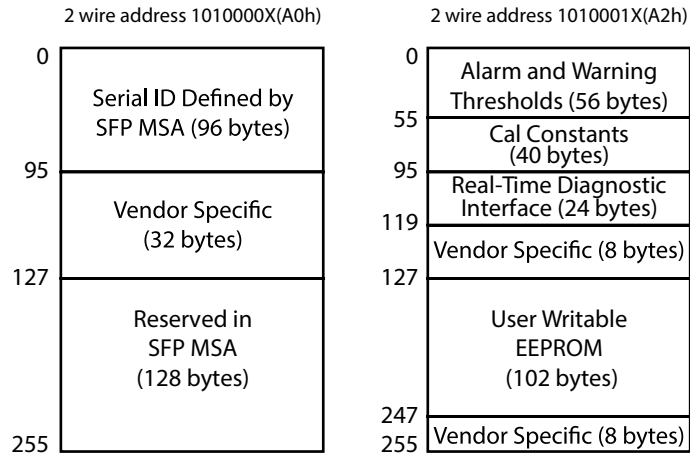
Notes:

1. TX Fault is an open collector/drain output, which should be pulled up with a 4.7K–10K resistor on the host board. Pull up voltage between 2.0V and $V_{ccT}/R+0.3V$. When high, output indicates a laser fault of some kind. Low indicates normal operation. In the low state, the output will be pulled to < 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 4.7 – 10 K resistor. Its states are: Low (0 – 0.8V): Transmitter on.(>0.8, < 2.0V): Undefined; High (2.0 – 3.465V): 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 resistor on the host board. The pull-up voltage shall be V_{ccT} or V_{ccR} . 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 (Loss of Signal) is an open collector/drain output, which should be pulled up with a 4.7K –10K resistor. Pull up voltage between 2.0V and $V_{ccT}/R+0.3V$. When high, this output indicates the received optical power is below the worst-case receiver Sensitivity (as defined by the standard in use). Low indicates normal operation. In the low state, the output will be pulled to <0.8V.

5. VeeR and VeeT may be internally connected within the SFP module.
6. RD-/+: These are the differential receiver outputs. They are AC coupled 100 differential Lines which should be terminated with 100 (differential) at the user SERDES. The AC coupling is done inside the module and is thus not required on the host board. The voltage swing on these lines will be between 400 and 2000 mV differential (200 –1000 mV single ended) when properly terminated.
7. VccR and VccT are the receiver and transmitter power supplies. They are defined as $3.3V \pm 5\%$ at the SFP connector pin. Maximum supply current is 300mA. Recommended host board power supply filtering is shown below. Inductors with DC resistance of less than 1 ohm should be used in order to maintain the required voltage at the SFP input pin with 3.3V supply voltage When the recommended supply-filtering network is used, hot plugging of the SFP transceiver module will result in an in rush current of no more than 30mA greater than the steady state value. VccR and VccT may be internally connected within the SFP transceiver module.
8. TD-/+: These are the differential transmitter inputs. They are AC-coupled, differential lines with 100 differential terminations inside the module. The AC coupling is done inside the module and is thus not required on the host board. The inputs will accept differential swings of 400 – 2000mV (200 – 1000mV single-ended)

9. SFP Module EEPROM Information and Management

The serial interface uses the 2-wire serial CMOS EEPROM protocol defined for the ATMEL. AT24C02/04 family of component. When the serial protocol is activated, the host generates the serial clock signal (SCL). The positive edge clocks data into those segments of the EEPROM that are not write protected within the SFP transceiver. The negative edge clocks data from the SFP transceiver. The serial data signal (SDA) is bi-directional for serial data transfer. The host uses SDA in conjunction with SCL to mark the start and end of serial protocol activation. The memories are organized as a series of 8-bit data words that can be addressed individually or sequentially .The Module provides diagnostic information about the present operating conditions. The transceiver generates this diagnostic data by digitization of internal analog signals. Calibration and alarm/warning threshold data is written during device manufacture. Received Power monitoring, transmitted power monitoring, bias current monitoring, supply voltage monitoring and temperature monitoring all are implemented. If the module is defined as external calibrated, the diagnostic data are raw A/D values and must be converted to real world units using calibration constants stored in EEPROM locations 56 – 95 at wire serial bus address A2h.The digital diagnostic memory map specific data field defines as following .For detail EEPROM information please refer to the related document of SFF 8472 Rev 9.3. EEPROM Serial



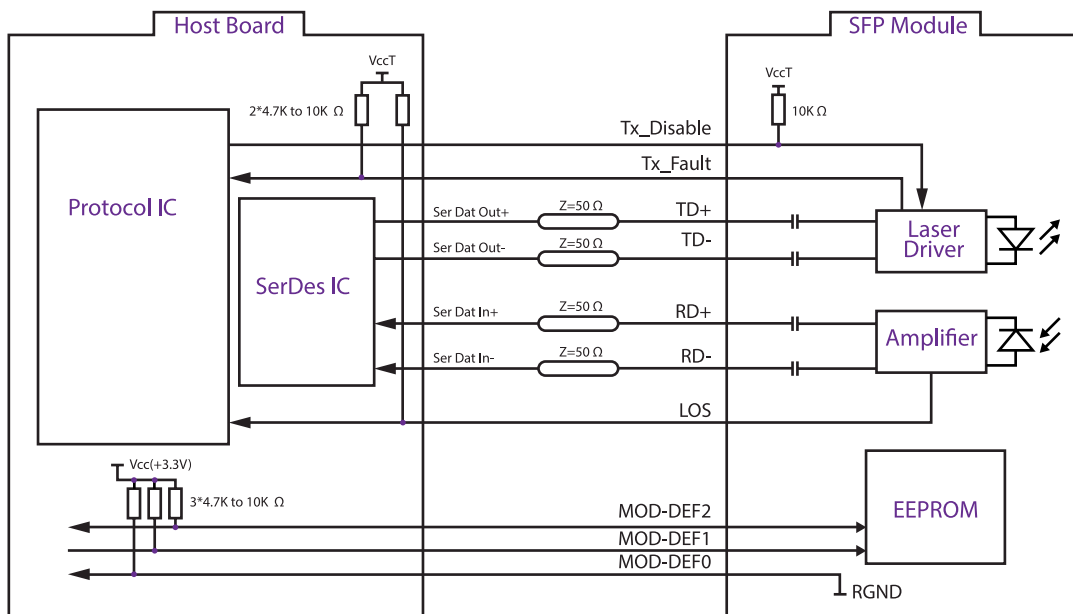
| Addr. | Size(Bytes) | Name of Field | Hex | Description |
|-----------------------|-------------|-----------------------|-------------------------|---|
| BASE ID FIELDS | | | | |
| 0 | 1 | Identifier | 03 | SFP |
| 1 | 1 | Ext. Identifier | 04 | SFP function is defined by serial ID only |
| 2 | 1 | Connector | 07 | LC Connector |
| 3-10 | 8 | Transceiver | XX | Transmitter Code |
| 11 | 1 | Encoding | 03 | NRZ |
| 12 | 1 | BR, Nominal | 19 | 2.488Gbps |
| 13 | 1 | Reserved | 00 | |
| 14 | 1 | Length (9µm) km | 02 | Transceiver Transmit Distance |
| 15 | 1 | Length(9µm) 100m | 14 | |
| 16 | 1 | Length (50µm) 10m | 00 | |
| 17 | 1 | Length(62.5µm) 10m | 00 | |
| 18 | 1 | Length (Copper) | 00 | Not Compliant |
| 19 | 1 | Reserved | 00 | |
| 20-35 | 16 | Vendor name | XX | (ASCII) |
| 36 | 1 | Reserved | 00 | |
| 37-39 | 3 | Vendor OUI | XX | |
| 40-55 | 16 | Vendor PN | XX | Transceiver part number |
| 56-59 | 4V | endor rev | XX | ASCII |
| 60-61 | 2 | Wavelength | 05 1E | 1310nm |
| 62 | 1 | Reserved | 00 | |
| 63 | 1 | CC_BASE | Check Sum (Variable) | Check Code for Base ID Fields |

| Addr. | Size(Bytes) | Name of Field | Hex | Description |
|----------------------------------|-------------|----------------------------|-----------|--|
| EXTENDED 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 | XX | Serial Number of transceiver (ASCII) |
| 84-91 | 8 | Date code | XX | Manufactory date code. |
| 92 | 1 | Diagnostic Monitoring Type | XX | Digital Diagnostic Monitoring Implemented |
| 93 | 1 | Enhanced Options | XX | Optional Flags |
| 94 | 1 | SFF_8472 Compliance | XX | 01 for Diagnostics (Rev9.3SFF-8472). |
| 95 | 1 | CC_EXT Checksum | XX | Checksum for extended ID Field. |
| VENDOR SPECIFIC ID FIELDS | | | | |
| 96-127 | 32 | Vendor Specific | Read only | Depends on customer information |
| 128-255 | 128 | Reserved | Read only | |

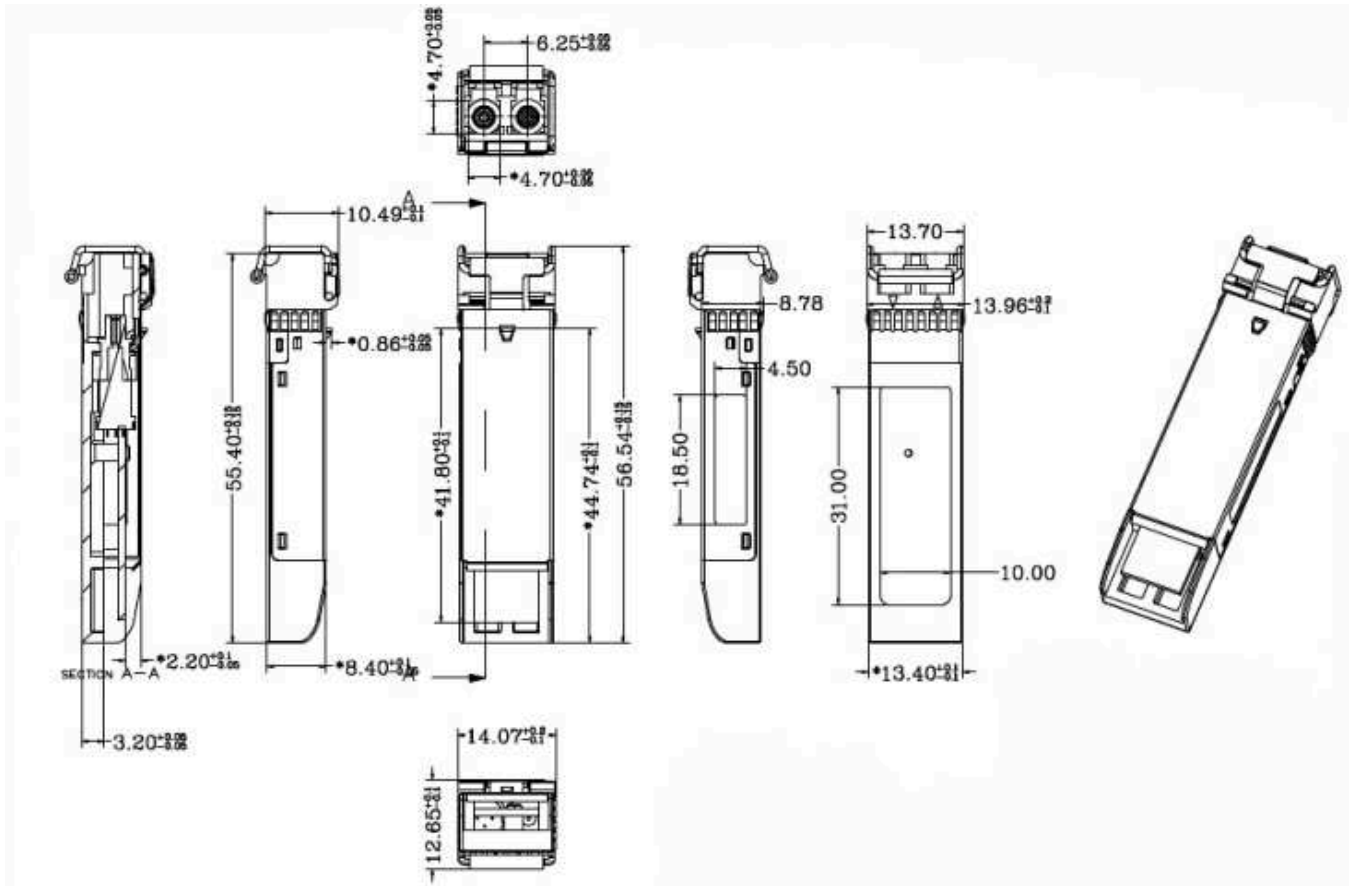
Note:

The “xx” byte should be filled in according to practical case .For more information. please refer to the related document of SFP Multi-Source Agreement (MSA).

10. Recommended Circuit



11. Mechanical Dimentions



12. Contact Information

Approved Networks is a leading supplier of Network Transceivers and Connectivity products to Channel Partners, Resellers, and OEMs. With more than 9 years of direct industry experience, our products are resident in the most demanding and mission critical functional networks Worldwide. We serve as a Master Distributor to the largest CMs in the world and deploy the most rigorous testing and firmware management programs to bring the highest level of functional product to the market at a cost that makes sense.

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