

Technical Datasheet

SFP-502-C

GIGAMON SYSTEMS® Compatible 1000Base-SX SFP Transceiver

Hot Pluggable, +3.3V, LC Duplex, 850nm, up to 550m, Commercial Temperature

FEATURES

- Up to 1.25Gb/s Data Links
- Hot-Pluggable
- Duplex LC connector
- Up to 550m on 50/125µm MMF
- 850nm VCSEL laser transmitter
- Single +3.3V Power Supply
- Low power dissipation <1W typically
- Commercial Operating Temperature Range: 0°C to 70°C
- RoHS compliant and Lead Free

APPLICATIONS

- Metro/Access Networks
- 1.25Gb/s 1000Base-SX Ethernet
- 1 × Fibre Channel
- Other Optical Links

DESCRIPTION

ATGBICS® Compatible SFP-502-C Transceiver is a high-performance, cost-effective module which has 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 850nm VCSEL laser, up to 8dB link budget ensure this module 1000Base Ethernet 550m application.

Absolute Maximum Ratings

| Parameter | Symbol | Min. | Typical | Max. | Unit |
|-----------------------|-----------------|------|---------|------|------|
| Operating Temperature | T _o | 0 | | 70 | °C |
| Storage Temperature | T _s | -40 | | 85 | °C |
| Supply Voltage | V _{cc} | -0.5 | | 4 | V |
| Relative Humidity | RH | 0 | | 85 | % |

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Recommended Operating Environment:

| Parameter | Symbol | Min. | Typical | Max. | Unit |
|-----------------------|--------------------|-------|---------|---------------------|------|
| Operating Temperature | | 0 | | 70 | °C |
| Supply Voltage | V _{CC} | 3.135 | | 3.465 | V |
| Supply Current | I _{CC} | | | 300 | mA |
| Inrush Current | I _{surge} | | | I _{CC} +30 | mA |
| Maximum Power | P _{max} | | | 1 | W |

Electrical Characteristics (T_{OP} = 0 to 70°C, V_{CC} = 3.135 to 3.465 Volts)

| Parameter | Symbol | Min. | Typical | Max. | Unit | Notes |
|--------------------------------|-------------------------|-----------------------|---------|----------------------|-------|-------|
| Transmitter Section: | | | | | | |
| Input differential impedance | R _{in} | 90 | 100 | 110 | Ω | □ |
| Single ended data input swing | V _{in PP} | 250 | | 1200 | mVp-p | |
| Transmit Disable Voltage | V _D | V _{CC} – 1.3 | | V _{CC} | V | 2 |
| Transmit Enable Voltage | V _{EN} | V _{EE} | | V _{EE} +0.8 | V | |
| Transmit Disable Assert Time | T _{dessert} | | | 10 | us | |
| Receiver Section: | | | | | | |
| Single ended data output swing | V _{out,p} p | 250 | | 800 | mv | 3 |
| LOS Fault | V _{losfault} | V _{CC} – 0.5 | | V _{CC_host} | V | 5 |
| LOS Normal | V _{los norm} | V _{EE} | | V _{EE} +0.5 | V | 5 |
| Power Supply Rejection | PSR | 100 | | | mVpp | 6 |

Notes:

1. AC coupled.
2. Or open circuit.
3. Into 100 Ohm differential termination.
4. 20 – 80%
5. LOS is LVTTTL. Logic 0 indicates normal operation; logic 1 indicates no signal detected.
6. All transceiver specifications are compliant with a power supply sinusoidal modulation of 20Hz to 1.5MHz up to specified value applied through the power supply filtering network shown on page 23 of the Small Form-factor Pluggable (SFP) Transceiver Multi-Source Agreement (MSA), September 14, 2000.

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Optical Parameters (T_{OP} = 0 to 70°C, VCC = 3.135 to 3.465 Volts)

| Parameter | Symbol | Min. | Typical | Max. | Unit | Note |
|---|---|------|---------|-------------------|-----------|------|
| Transmitter Section: | | | | | | |
| Center Wavelength | λ_c | 840 | 850 | 860 | nm | |
| Spectral Width (RMS) | σ_{RMS} | | | 0.85 | nm | |
| Optical Output Power | P _{out} | -9 | | -3 | dBm | 1 |
| Extinction Ratio | ER | 9 | | | dB | |
| Optical Rise/Fall Time | t _r / t _f | | | 260 | ps | 2 |
| Relative Intensity Noise | RIN | | | -120 | dB/H z | |
| Output Eye Mask | Compliant with IEEE802.3 z (class 1 laser safety) | | | | | |
| Receiver Section: | | | | | | |
| Optical Input Wavelength | λ_c | 770 | | 860 | nm | |
| Receiver Overload | P _{ol} | 0 | | | dBm | 4 |
| RX Sensitivity | Sen | | | -17 | dBm | 4 |
| RX_LOS Assert | LOS _A | -35 | | | dBm | |
| RX_LOS De-assert | LOS _D | | | -18 | dBm | |
| RX_LOS Hysteresis | LOS _H | 0.5 | | | dB | |
| General Specifications: | | | | | | |
| Data Rate | BR | | 1250 | | Mb/s | |
| Bit Error Rate | BER | | | 10 ⁻¹² | | |
| Max. Supported Link Length on 50/125µm MMF@1250Gb/s | L _{MAX} | | 550 | | m | |
| Total System Budget | LB | 8 | | | dB | |

Notes:

1. The optical power is launched into MMF.
2. 20-80%.
3. Jitter measurements taken using Agilent OMNIBERT 718 in accordance with GR-253.
4. Measured with PRBS 2⁷⁻¹ at 10⁻¹² BER

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Pin Assignment

Diagram of Host Board Connector Block Pin Numbers and Name



Diagram of Host Board Connector Block Pin Numbers and Names

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Pin Function Definitions

| Pin No | Name | Function | Plug Seq | Notes |
|--------|-------------|------------------------------|----------|-------|
| 1 | VeeT | Transmitter Ground | 1 | 1 |
| 2 | TX Fault | Transmitter Fault Indication | 3 | |
| 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 | 4 |
| 8 | LOS | Loss of Signal | 3 | 5 |
| 9 | VeeR | Receiver Ground | 1 | 1 |
| 10 | VeeR | Receiver Ground | 1 | 1 |
| 11 | VeeR | Receiver Ground | | 1 |
| 12 | RD- | Inv. Received Data Out | 3 | 6 |
| 13 | RD+ | Received Data Out | 3 | 6 |
| 14 | VeeR | Receiver Ground | 3 | 1 |
| 15 | VccR | Receiver Power | 2 | 1 |
| 16 | VccT | Transmitter Power | 2 | |
| 17 | VeeT | Transmitter Ground | 1 | |
| 18 | TD+ | Transmit Data In | 3 | 6 |
| 19 | TD- | Inv. Transmit In | 3 | 6 |
| 20 | VeeT | Transmitter Ground | 1 | |

Notes:

1. Circuit ground is internally isolated from chassis ground.
2. Laser output disabled on TDIS >2.0V or open, enabled on TDIS <0.8V.
3. Should be pulled up with 4.7k - 10 kohms on host board to a voltage between 2.0V and 3.6V. MOD_DEF (0) pulls line low to indicate module is plugged in.
4. Rate select is not used
5. LOS is open collector output. Should be pulled up with 4.7k – 10 kohms on host board to a voltage between 2.0V and 3.6V. Logic 0 indicates normal operation; logic 1 indicates loss of signal.
6. AC Coupled

SFP Module EEPROM Information and Management

The SFP modules implement the 2-wire serial communication protocol as defined in the SFP -8472. The serial ID information of the SFP modules can be accessed through the I²C interface at address A0h.

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EEPROM Serial ID Memory Contents (A0h)

| Data Address | Length (Byte) | Name of Length | Description and Contents |
|---------------------------|---------------|----------------|---|
| Base ID Fields | | | |
| 0 | 1 | Identifier | Type of Serial transceiver (03h=SFP) |
| 1 | 1 | Reserved | Extended identifier of type serial transceiver (04h) |
| 2 | 1 | Connector | Code of optical connector type (07=LC) |
| 3-10 | 8 | Transceiver | |
| 11 | 1 | Encoding | NRZ(03h) |
| 12 | 1 | BR, Nominal | Nominal baud rate, unit of 100Mbps |
| 13-14 | 2 | Reserved | (0000h) |
| 15 | 1 | Length(9um) | Link length supported for 9/125um fiber, units of 100m |
| 16 | 1 | Length(50um) | Link length supported for 50/125um fiber, units of 10m |
| 17 | 1 | Length(62.5um) | Link length supported for 62.5/125um fiber, units of 10m |
| 18 | 1 | Length(Copper) | Link length supported for copper, units of meters |
| 19 | 1 | Reserved | |
| 20-35 | 16 | Vendor Name | SFP vendor name: ATGBICS |
| 36 | 1 | Reserved | |
| 37-39 | 3 | Vendor OUI | SFP transceiver vendor OUI ID |
| 40-55 | 16 | Vendor PN | Part Number: "SFP-502-C" (ASCII) |
| 56-59 | 4 | Vendor rev | Revision level for part number |
| 60-62 | 3 | Reserved | |
| 63 | 1 | CCID | Least significant byte of sum of data in address 0-62 |
| Extended ID Fields | | | |
| 64-65 | 2 | Option | Indicates which optical SFP signals are implemented (001Ah = LOS, TX_FAULT, TX_DISABLE all supported) |
| 66 | 1 | BR, max | Upper bit rate margin, units of % |
| 67 | 1 | BR, min | Lower bit rate margin, units of % |
| 68-83 | 16 | Vendor SN | Serial number (ASCII) |
| 84-91 | 8 | Date code | Manufacturing date code |
| 92-94 | 3 | Reserved | |
| 95 | 1 | CCEX | Check code for the extended ID Fields (addresses 64 to 94) |

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| Vendor Specific ID Fields | | | |
|---------------------------|-----|----------|---------------------------------|
| 96-127 | 32 | Readable | Vendor specific date, read only |
| 128-255 | 128 | Reserved | Reserved for SFF-8079 |

Regulatory Compliance

The SFP-502-C complies with international Electromagnetic Compatibility (EMC) and international safety requirements and standards (see details in Table following).

| | | |
|---|--|--|
| Electrostatic Discharge (ESD) to the Electrical Pins | MIL-STD-883E Method 3015.7 | Class 1(>1000 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 |
| Laser Eye Safety | FDA 21CFR 1040.10 and 1040.11 EN60950, EN (IEC) 60825-1,2 | Compatible with Class 1 laser product. |

Recommended Circuit



SFP Host Recommended Circuit

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Mechanical Dimensions (units: mm)



Mechanical Drawing