

## Product Datasheet

### LC-MM-SFP-I-C

#### Vertiv Avocent® Compatible 1.25Gb/s 550m SFP Transceiver, Industrial Version

Hot Pluggable, Duplex LC, +3.3V, 850nm, VCSEL MMF 550m DOM -40~85C

#### 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
- Industrial operating temperature range -40°C to 85°C
- RoHS compliant and Lead Free

#### APPLICATIONS

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

#### DESCRIPTION

ATGBICS® Compatible LC-MM-SFP-I Transceiver is a high-performance, cost-effective module which has a duplex LC optics interface. Standard AC coupled CML for high-speed signal and LVTTL control and monitor signals. The receiver section uses a PIN receiver and the transmitter uses a 850 nm VCSEL laser, up to 8dB link budget ensure this module 1000Base Ethernet 550m application.

#### Absolute Maximum Ratings

| Parameter           | Symbol          | Min. | Typical | Max. | Unit |
|---------------------|-----------------|------|---------|------|------|
| Storage Temperature | T <sub>s</sub>  | -40  |         | +85  | °C   |
| Supply Voltage      | V <sub>CC</sub> | -0.5 |         | 4    | V    |
| Relative Humidity   | RH              | 0    |         | 85   | %    |

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### Recommended Operating Environment:

| Parameter             | Symbol             | Min.  | Typical | Max.                | Unit |
|-----------------------|--------------------|-------|---------|---------------------|------|
| Operating Temperature |                    | -40   |         | +85                 | °C   |
| Supply Voltage        | V <sub>CC</sub>    | 3.135 |         | 3.465               | V    |
| Supply Current        | I <sub>CC</sub>    |       |         | 300                 | mA   |
| Inrush Current        | I <sub>surge</sub> |       |         | I <sub>CC</sub> +30 | mA   |
| Maximum Power         | P <sub>max</sub>   |       |         | 1                   | W    |

### Electrical Characteristics (T<sub>OP</sub> = -40 to 85°C, V<sub>CC</sub> = 3.135 to 3.465 Volts)

| Parameter                      | Symbol                | Min.                  | Typical | Max.                 | Unit  | Notes |
|--------------------------------|-----------------------|-----------------------|---------|----------------------|-------|-------|
| <b>Transmitter Section:</b>    |                       |                       |         |                      |       |       |
| Input differential impedance   | R <sub>in</sub>       | 90                    | 100     | 110                  |       |       |
| Single ended data input swing  | V <sub>in PP</sub>    | 250                   |         | 1200                 | mVp-p |       |
| Transmit Disable Voltage       | V <sub>D</sub>        | V <sub>CC</sub> – 1.3 |         | V <sub>CC</sub>      | V     | 2     |
| Transmit Enable Voltage        | V <sub>EN</sub>       | V <sub>EE</sub>       |         | V <sub>EE</sub> +0.8 | V     |       |
| Transmit Disable Assert Time   | T <sub>dessert</sub>  |                       |         | 10                   | us    |       |
| <b>Receiver Section:</b>       |                       |                       |         |                      |       |       |
| Single ended data output swing | V <sub>out,p p</sub>  | 250                   |         | 800                  | mv    | 3     |
| LOS Fault                      | V <sub>losfault</sub> | V <sub>CC</sub> – 0.5 |         | V <sub>CC_host</sub> | V     | 5     |
| LOS Normal                     | V <sub>los norm</sub> | V <sub>EE</sub>       |         | V <sub>EE</sub> +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 20 Hz 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 ( $T_{OP} = -40$  to  $85^{\circ}\text{C}$ ,  $V_{CC} = 3.135$  to  $3.465$  Volts)

| Parameter                                           | Symbol                                            | Min. | Typical | Max.       | Unit      | Note |
|-----------------------------------------------------|---------------------------------------------------|------|---------|------------|-----------|------|
| Transmitter Section:                                |                                                   |      |         |            |           |      |
| Center Wavelength                                   | $\lambda_c$                                       | 840  | 850     | 860        | nm        |      |
| Spectral Width (RMS)                                | $\sigma_{RMS}$                                    |      |         | 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<br>z |      |
| Output Eye Mask                                     | Compliant with IEEE802.3 z (class 1 laser safety) |      |         |            |           |      |
| Receiver Section:                                   |                                                   |      |         |            |           |      |
| Optical Input Wavelength                            | $\lambda_c$                                       | 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                                                |      | 1.25    |            | Gb/s      |      |
| Bit Error Rate                                      | BER                                               |      |         | $10^{-12}$ |           |      |
| Max. Supported Link Length on 50/125μm MMF@1.25Gb/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  $2^{7-1}$  at  $10^{-12}$  BER

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### Pin Assignment

Diagram of Host Board Connector Block Pin Numbers and Name

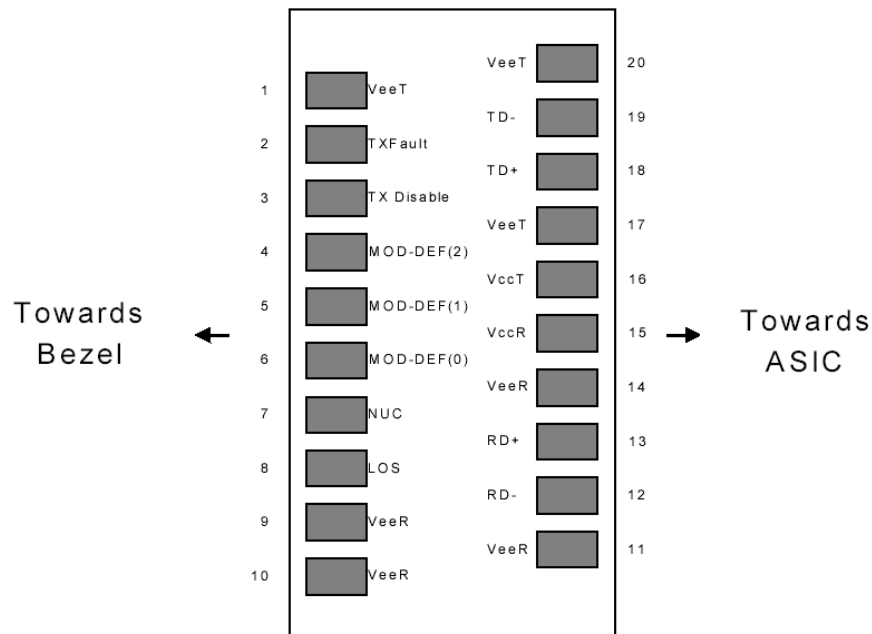


Diagram of Host Board Connector Block Pin Numbers and Names

## Product Datasheet

### 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 I<sup>2</sup>C interface at address A0h.

## Product Datasheet

### EEPROM Serial ID Memory Contents (A0h)

| Data Address              | Length (Byte) | Name of Length  | Description and Contents                                                                              |
|---------------------------|---------------|-----------------|-------------------------------------------------------------------------------------------------------|
| <b>Base ID Fields</b>     |               |                 |                                                                                                       |
| 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: "LC-MM-SFP-I-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                                                 |
| <b>Extended ID Fields</b> |               |                 |                                                                                                       |
| 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

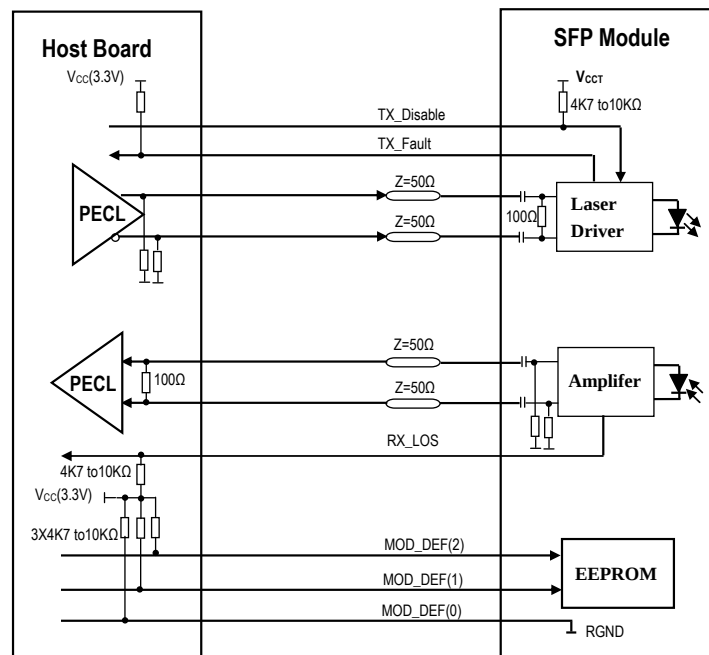
|                |     |          |                                 |
|----------------|-----|----------|---------------------------------|
| <b>96-127</b>  | 32  | Readable | Vendor specific date, read only |
| <b>128-255</b> | 128 | Reserved | Reserved for SFF-8079           |

### Regulatory Compliance

The GLX-SX-MMD-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<br>EN55022 Class B (CISPR 22B)<br>VCCI Class B | Compatible with standards              |
| Laser Eye Safety                                          | FDA 21CFR 1040.10 and 1040.11<br>EN60950, EN (IEC) 60825-1,2       | Compatible with Class 1 laser product. |

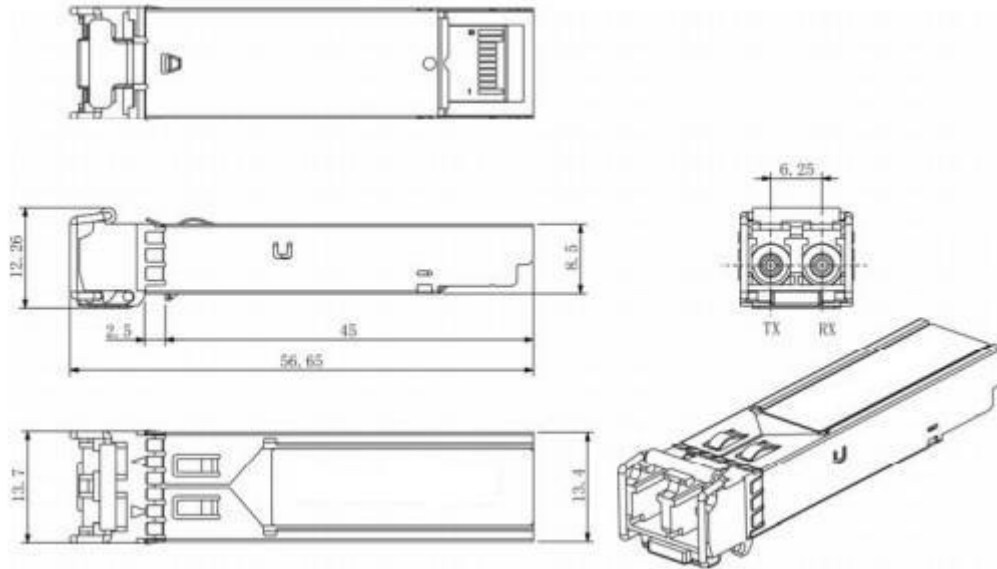
### Recommended Circuit



**SFP Host Recommended Circuit**

## Product Datasheet

### Mechanical Dimensions



### Mechanical Drawing