



## SFP-M2 1.25 Gigabit Ethernet-Multimode Transceiver

SFP, Duplex LC Connector, 1310nm FP LD for Multimode Fiber, RoHS Compliant



### Applications

- Gigabit Ethernet Links
- Fiber Channel Links at 1.06 Gbps
- High Speed Backplane Interconnects
- Switched Backbones

### Features

- 1310nm FP LD
- Multi Data Rate: from 125M to 1.25Gbps, NRZ
- Data Rate: 1.25Gbps, NRZ
- Single +3.3V Power Supply
- RoHS Compliant and Lead-free
- AC/AC Differential Electrical Interface
- Compliant with Multi-Source Agreement (MSA) Small Form Factor Pluggable (SFP)
- Duplex LC Connector
- Compliance with specifications for IEEE-802.3z Gigabit Ethernet at 1.25 Gbps
- Compliance with ANSI specifications for Fibre Channel applications at 1.06 Gbps
- Eye Safety  
Designed to meet Laser Class 1, complies with EN60825-1

### Description

The SFP-M2 from AAXEON is the high performance and cost-effective module for serial optical data communication applications specified for multimode of 1.25 Gb/s. It operates on +3.3V power. The module is intended for multimode fiber, operates at a nominal wavelength of 1310nm, and complies with Multi-Source Agreement (MSA) Small Form Factor Pluggable (SFP). Each module is integrated digital diagnostics functions via an I<sup>2</sup>C serial interface (optional).

The module is a duplex LC connector transceiver designed for use in Gigabit Ethernet applications and to provide IEEE-802.3z compliant link for 1.25Gb/s short reach applications. The characteristics are performed in accordance with Telcordia Specification GR-468-CORE.

### EMC

Most equipment utilizing high-speed transceivers will be required to meet the following requirements:

- 1) FCC in the United States
- 2) CENELEC EN55022 (CISPR 22) in Europe

To assist the customer in managing the overall equipment EMC performance, the transceivers have been designed to satisfy FCC class B limits and provide good immunity to radio-frequency electromagnetic fields.

### Eye Safety

The transceivers have been designed to meet Class 1 eye safety and comply with EN 60825-1.



## SFP-M2 1.25 Gigabit Ethernet-Multimode Transceiver

### Product Information

| Model Number | Operating Temperature. & Monitor Function | Distance | LD Type & Wavelength | Output Power  | Sensitivity |
|--------------|-------------------------------------------|----------|----------------------|---------------|-------------|
| SFP-M2       | 0~70°                                     | 2 km     | 1310 nm FP           | -9.5 ~ +1 dBm | ≤-23 dBm    |

### ABSOLUTE MAX RATINGS

| PARAMETER           | SYMBOL          | MIN | MAX             | UNIT | NOTE |
|---------------------|-----------------|-----|-----------------|------|------|
| Storage Temperature | T <sub>S</sub>  | -40 | 85              | °C   |      |
| Supply Voltage      | V <sub>CC</sub> | 0   | 6               | V    |      |
| Data Input Voltage  | ---             | 0   | V <sub>CC</sub> | V    |      |
| Supply Current      | I <sub>S</sub>  |     | 300             | mA   |      |

### OPERATING CONDITIONS

| PARAMETER                | SYMBOL          | MIN. | TYP. | MAX. | UNIT | NOTE |
|--------------------------|-----------------|------|------|------|------|------|
| Supply Voltage           | V <sub>CC</sub> | 3.1  |      | 3.5  | V    |      |
| Data Input Voltage Swing | V <sub>ID</sub> | 300  |      | 1860 | mV   |      |

### ELECTRICAL CHARACTERISTICS

| PARAMETER                                 | SYMBOL           | MIN                   | MAX                   | UNIT | NOTE |
|-------------------------------------------|------------------|-----------------------|-----------------------|------|------|
| <b>Transmitter</b>                        |                  |                       |                       |      |      |
| Transmitter Supply Current                | I <sub>CCT</sub> |                       | 200                   | mA   |      |
| Tx_Disable Input Voltage - Low            | V <sub>IL</sub>  | 0                     | 0.8                   | V    |      |
| Tx_Disable Input Voltage - High           | V <sub>IH</sub>  | 2.0                   | V <sub>CC</sub>       | V    |      |
| Tx_Fault Output Voltage - Low             | V <sub>OL</sub>  | 0                     | 0.8                   | V    |      |
| Tx_Fault Output Voltage - High            | V <sub>OH</sub>  | 2.0                   | V <sub>CC</sub>       | V    |      |
| <b>Receiver</b>                           |                  |                       |                       |      |      |
| Receiver Supply Current                   | I <sub>CCR</sub> |                       | 100                   | mA   |      |
| Receiver Data Output Differential Voltage | V <sub>OD</sub>  | 0.4                   | 1.3                   | V    |      |
| Rx_LOS Output Voltage - Low               | V <sub>OL</sub>  | 0                     | 0.8                   | V    |      |
| Rx_LOS Output Voltage - High              | V <sub>OH</sub>  | 2.0                   | V <sub>CC</sub>       | V    |      |
| MOD_DEF (1) , MOD_DEF (2) - Low           | V <sub>IL</sub>  | -0.6                  | V <sub>CC</sub> × 0.3 | V    |      |
| MOD_DEF (1) , MOD_DEF (2) - High          | V <sub>IH</sub>  | V <sub>CC</sub> × 0.7 | V <sub>CC</sub> + 0.5 | V    |      |

### TRANSMITTER ELECTRO-OPTICAL CHARACTERISTICS

| PARAMETER                    | SYMBOL         | MIN                            | TYP. | MAX  | UNIT  | NOTE |
|------------------------------|----------------|--------------------------------|------|------|-------|------|
| Optical Output Power         | P <sub>O</sub> | -9.5                           |      | +1   | dBm   | 1    |
| Extinction Ratio             | ER             | 9                              |      |      | dB    |      |
| Center Wavelength            | λ <sub>c</sub> | 1270                           |      | 1355 | nm    |      |
| Spectral Width (RMS)         | Δλ             |                                |      | 4    | nm    |      |
| RIN                          | RIN            |                                |      | -117 | dB/Hz |      |
| Optical Rise time (20%-80% ) | t <sub>r</sub> |                                |      | 260  | ps    | 2    |
| Optical Fall time (20%-80% ) | t <sub>f</sub> |                                |      | 260  | ps    | 2    |
| Output Eye                   |                | Compliant with IEEE802.3z/D5.0 |      |      |       |      |



## SFP-M2 1.25 Gigabit Ethernet-Multimode Transceiver

### RECEIVER ELECTRO-OPTICAL CHARACTERISTICS

| PARAMETER                                      | SYMBOL      | MIN       | TYP. | MAX  | UNIT | NOTE |
|------------------------------------------------|-------------|-----------|------|------|------|------|
| Maximum Input Optical Power                    | $P_{max}$   | -3        |      |      | dBm  | 3    |
| Minimum Input Optical Power                    | 1.25Gb/s    |           |      | -23  |      | 3    |
|                                                | 1.06Gb/s    |           |      | -23  |      | 3    |
|                                                | 622Mb/s     | $P_{min}$ |      | -23  | dBm  | 4    |
|                                                | 155Mb/s     |           |      | -23  |      | 4    |
|                                                | 125Mb/s     |           |      | -23  |      | 3    |
| Operating Wavelength                           | $\lambda$   | 1100      |      | 1600 | nm   |      |
| Optical Return Loss                            | ORL         | 12        |      |      | dB   |      |
| Receiver Electrical 3dB Upper Cutoff Frequency | ---         |           |      | 1500 | MHz  |      |
| LOS of Signal - Asserted                       | $P_A$       | -35       |      |      | dBm  |      |
| LOS of Signal - Deasserted                     | $P_D$       |           |      | -22  | dBm  |      |
| Loss of Signal -Hysterisis                     | $P_D - P_A$ | 0.5       |      |      | dB   |      |

#### Notes:

1. Measured average power coupled into 62.5/125 $\mu$ m, 0.275 NA graded index multimode fiber.
2. These are 20-80% values.
3. Measured with  $2^7-1$  PRBS at  $BER < 10^{-12}$
4. Measured with  $2^{23}-1$  PRBS at  $BER < 10^{-10}$

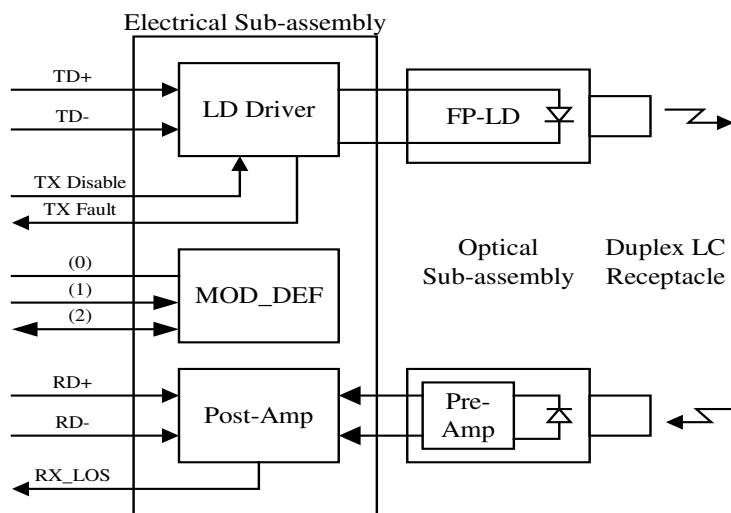
### TIMING CHARACTERISTICS

| PARAMETER                                       | SYMBOL          | MIN | TYP. | MAX | UNIT    | NOTE |
|-------------------------------------------------|-----------------|-----|------|-----|---------|------|
| TX_DISABLE Assert Time                          | $t_{off}$       |     |      | 10  | $\mu$ s |      |
| TX_DISABLE Negate Time                          | $t_{on}$        |     |      | 1   | ms      |      |
| Time to initialize, include reset of TX_FAULT   | $t_{init}$      |     |      | 300 | ms      |      |
| TX_FAULT from fault to assertion                | $t_{fault}$     |     |      | 100 | $\mu$ s |      |
| TX_DISABLE time to start reset                  | $t_{reset}$     | 10  |      |     | $\mu$ s |      |
| Receiver Loss of Signal Assert Time (off to on) | $t_{A,RX\_LOS}$ |     |      | 100 | $\mu$ s |      |
| Receiver Loss of Signal Assert Time (on to off) | $t_{D,RX\_LOS}$ |     |      | 100 | $\mu$ s |      |



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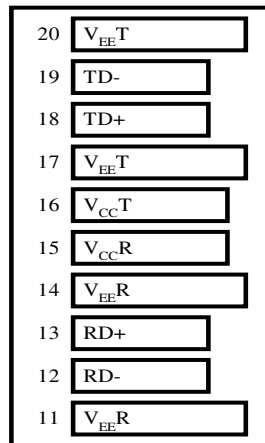
### BLOCK DIAGRAM OF TRANSCEIVER



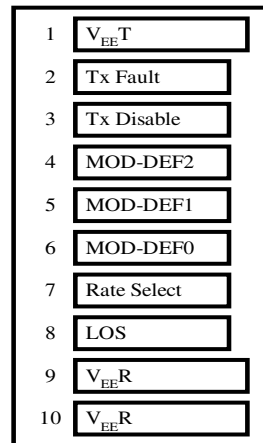


## SFP-M2 1.25 Gigabit Ethernet-Multimode Transceiver

### PIN OUT DIAGRAM OF TRANSCEIVER



Top of Board



Bottom of Board (As Viewed  
through Top of Board)

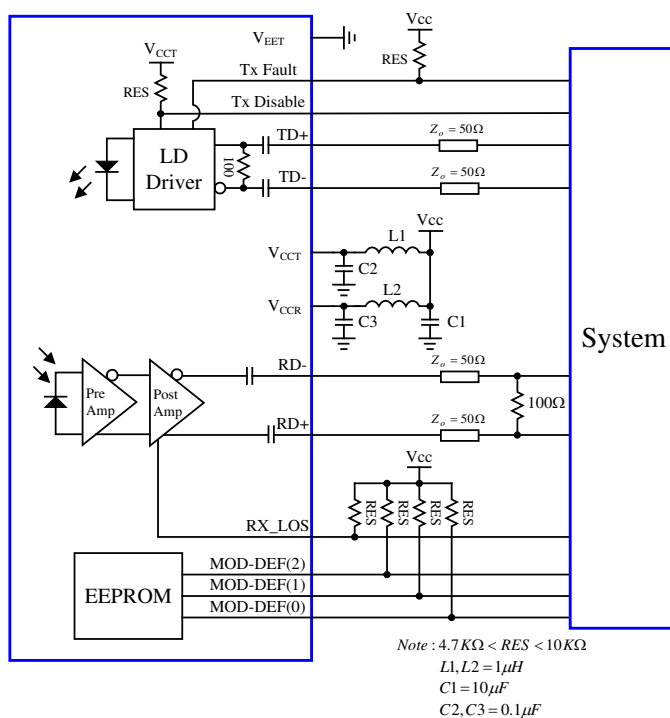
### PIN OUT TABLE

| Pin | Symbol      | Functional Description                                |
|-----|-------------|-------------------------------------------------------|
| 1   | VeeT        | Transmitter Ground                                    |
| 2   | TX Fault    | Transmitter Fault Indication                          |
| 3   | TX Disable  | Transmitter Disable – Module disables on high or open |
| 4   | MOD-DEF(2)  | Module Definition 2 – Two wire serial ID interface    |
| 5   | MOD-DEF(1)  | Module Definition 1 – Two wire serial ID interface    |
| 6   | MOD-DEF(0)  | Module Definition 0 – Grounded in module              |
| 7   | Rate Select | Not Connected                                         |
| 8   | LOS         | Loss of Signal                                        |
| 9   | VeeR        | Receiver Ground                                       |
| 10  | VeeR        | Receiver Ground                                       |
| 11  | VeeR        | Receiver Ground                                       |
| 12  | RD-         | Inverse Received Data Out                             |
| 13  | RD+         | Received Data Out                                     |
| 14  | VeeR        | Receiver Ground                                       |
| 15  | VccR        | Receiver Power                                        |
| 16  | VccT        | Transmitter Power                                     |
| 17  | VeeT        | Transmitter Ground                                    |
| 18  | TD+         | Transmitter Data In                                   |
| 19  | TD-         | Inverse Transmitter Data In                           |
| 20  | VeeT        | Transmitter Ground                                    |

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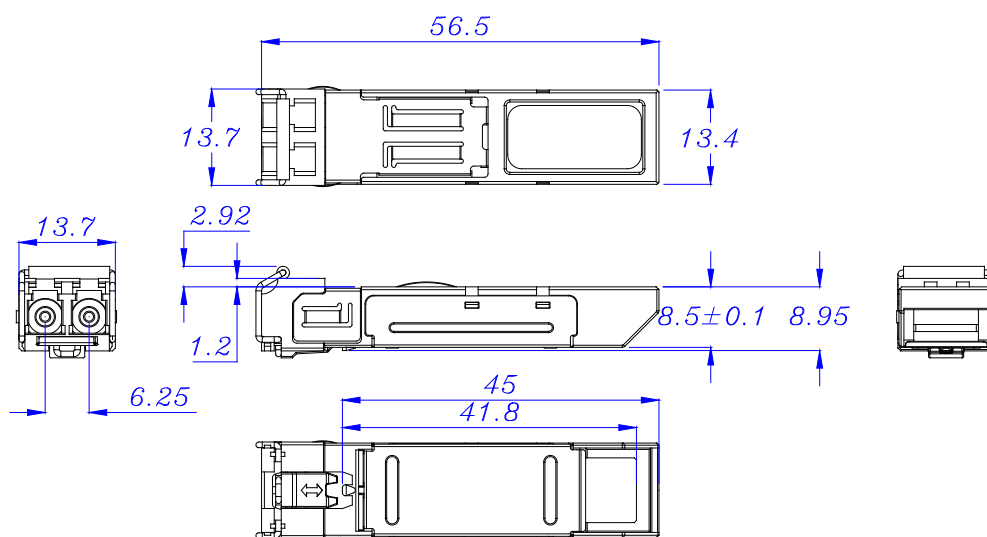
## SFP-M2 1.25 Gigabit Ethernet-Multimode Transceiver

### RECOMMENDED CIRCUIT SCHEMATIC



### MECHANICAL DIMENSIONS

Units in mm



All dimensions are  $\pm 0.2\text{mm}$  unless otherwise specified.

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