



## FTF-M1XG-S31L-22MD

SFP+ 10GBase-SR, 1310nm, multi-mode, 220m



### Description

FTF-M1XG-S31L-22MD series SFP+ transceiver can be used to setup a reliable, high speed serial data link over multi-mode fiber. Maximum link span over OM3 fiber can reach 220m. Casing made fully from metal alloys ensures very good EMI immunity. Module is fully compliant with SFP+ MSA specification and it is available in two hardware versions:

| Model               | Operating case temperature |
|---------------------|----------------------------|
| FTF-M1XG-S31L-22MD  | 0~70°C                     |
| FTF-M1XG-S31L-22MDI | -40~85°C                   |

Host device can access module internal EEPROM memory and DDMI via I<sup>2</sup>C interface.

Built-in digital diagnostic interface (DOM, DDMI) allows a network administrator to monitor module parameters such as: transmitted and received optical power, temperature, supply voltage and laser current. Those information and data are very helpful e.g. in prediction and prevention of connection failures. A module is available in various dedicated versions, which can be compatible with devices from vendors such as Cisco, HP, Juniper, Extreme Networks, Alcatel-Lucent, 3Com, Linksys and more.

### Applications

- 10G Ethernet
- Fiber Channel (10G FC)
- SONET/SDH (OC-192/STM64)
- Gigabit Ethernet (1.25Gbps)



## Key features

- LC Duplex receptacle
- Transmission distance up to 220m\*
- Fabry-Perot laser diode 1310nm transmitter, PIN receiver
- Throughput up to 11.3Gb/s
- Fully compliant with SFP+ MSA INF-8431 and INF-8472 rev. 11.3
- Hot-Pluggable
- RoHS compliant
- Class 1 laser safety
- Low power dissipation (<1W)
- Metal case for low EMI
- Operating case temperature\* : 0~70°C / -40~85°C

## Specification

### Supported transmission technology

10G Ethernet, Fibre Channel

### Speed supported for Ethernet technology

10.25Gbps, 1.25Gbps

### Speed supported for Fibre Channel technology

10.51875Gbps

### Transmission medium

Multi-mode fiber 50/125µm or 62.5/125µm [on shorter distance]

### Transmission distance\*\*

220m

### Receptacle type

LC Duplex

### Wavelength

1310nm

### Output power

-6.5~+0.5dBm

### Receiver sensitivity

-8.5dBm

### Power supply voltage

3.3V

### Total power consumption

< 1W

### Operating environment – temperature\*

0~70°C / -40~+85°C

### Operating environment - humidity

5~95% non-condensing

### Dimensions

Compliant with SFP+ Multi-Source Agreement

\* - standard / industrial version

\*\* - transmission distance depends on optical link attenuation



## Detailed technical specification

### Pin Description

| Pin | Name       | Function/Description                                | Engagement order | Notes |
|-----|------------|---|------------------|-------|
| 1   | VeeT       | Transmitter Ground                                  | 1                | 8     |
| 2   | TX Fault   | Transmitter Fault Indication                        | 3                | 1     |
| 3   | TX Disable | Transmitter Disable-Module disables on high or open | 3                | 2     |
| 4   | SDA        | Module Definition 2-Two wire serial ID interface    | 3                | 3     |
| 5   | SCL        | Module Definition 1-Two wire serial ID interface    | 3                | 3     |
| 6   | MOD_ABS    | Module Definition 0-Grounded in module              | 3                | 3     |
| 7   | RS0        | Not Used  | 3                | -     |
| 8   | RX_LOS     | Receiver Loss of Signal                             | 3                | 4     |
| 9   | RS1        | Not Used  | 1                | -     |
| 10  | VeeR       | Receiver Ground                                     | 1                | 8     |
| 11  | VeeR       | Receiver Ground                                     | 1                | 8     |
| 12  | RD-        | Inverse Received Data out                           | 3                | 5     |
| 13  | RD+        | Received Data out                                   | 3                | 5     |
| 14  | VeeR       | Receiver Ground                                     | 1                | 8     |
| 15  | VccR       | Receiver Power - +3.3V±5%                           | 2                | 6     |
| 16  | VccT       | Transmitter Power - +3.3 V±5%                       | 2                | 6     |
| 17  | VeeT       | Transmitter Ground                                  | 1                | 8     |
| 18  | TD+        | Transmitter Data In                                 | 3                | 7     |
| 19  | TD-        | Inverse Transmitter Data In                         | 3                | 7     |
| 20  | VeeT       | Transmitter Ground                                  | 1                | 8     |

#### Notes:

- TX Fault is open collector/drain output which should be pulled up externally with a 4.7KΩ-10KΩ resistor on the host board. When high, this output indicates a laser fault of some kind. Low indicates normal operation.
- TX Disable input is used to shut down the laser output per the state table below. It is pulled up to Vcc within the module.  
Low (0 – 0.8V): Transmitter on  
Open or High (2.0 – VccT): Transmitter Disabled
- Mod-Def 0, 1, 2. These are the module definition pins. They should be pulled up to Vcc with a 4.7KΩ-10KΩ resistor on the host board  
Mod-Def 0 is grounded by the module to indicate that the module is present.  
Mod-Def 1 is clock line of two wire serial interface for optional serial ID.  
Mod-Def 2 is data line of two wire serial interface for optional serial ID.
- LOS - when high, output indicates the received optical power is below the worst case receiver sensitivity. Low indicates normal operation.
- These are the differential receiver outputs. They are AC coupled 100Ω differential lines which should be terminated with 100Ω differential at the user SERDES. The AC coupling is done inside the module and thus not required on the host board.
- VccR and VccT are the receiver and transmitter power supplies. They are defined as 3.3V±5% at the SFP connector pin. The in-rush current will typically be no more than 30mA above steady state supply current after 500ns.
- TD-/+: These are the differential transmitter inputs. They are 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.
- The module signal grounds are isolated from the module case.



## Electrical parameters

| Parameter                           | Symbol          | Min. | Typ. | Max.            | Unit   | Notes |
|-------------------------------------|-----------------|------|------|-----------------|--------|-------|
| Transmitter Differential Input Volt | +/-TX_DAT       | 180  |      | 700             | mV p-p | 1     |
| Receiver Differential Output Volt   | +/-RX_DAT       | 180  |      | 850             | mV p-p | 2     |
| 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      | 3     |
| Tx_Fault Output Voltage – High      | V <sub>OH</sub> | 2.0  |      | V <sub>CC</sub> | V      | 3     |
| Rx_LOS Output Voltage- Low          | V <sub>OL</sub> | 0    |      | 0.8             | V      | 3     |
| Rx_LOS Output Voltage- High         | V <sub>OH</sub> | 2.0  |      | V <sub>CC</sub> | V      | 3     |
| Throughput                          | B               |      |      | 11.3            | Gb/s   |       |
| Total current requirement           |                 |      |      | 290             | mA     |       |

## Transmitter parameters

| Parameter              | Symbol                                    | Min. | Typ. | Max. | Unit | Notes |
|------------------------|---|------|------|------|------|-------|
| Central wavelength     | $\lambda_c$                               | 1260 | 1310 | 1355 | nm   |       |
| Spectral width         | $\Delta\lambda$                           |      |      | 4    | nm   |       |
| Launch optical power   | P <sub>o</sub>                            | -6.5 |      | +0.5 | dBm  | 4     |
| Extinction ratio       | EX  | 3.5  |      |      | dB   |       |
| Dispersion penalty     |   |      |      | 4.7  | dB   |       |
| Optical rise/fall time | T <sub>rise</sub> /T <sub>fall</sub>      |      |      | 30   | ps   | 5     |
| Eye diagram            | Compliant with IEEE802.3-2005 10G BASE-SR |      |      |      |      |       |

## Receiver parameters

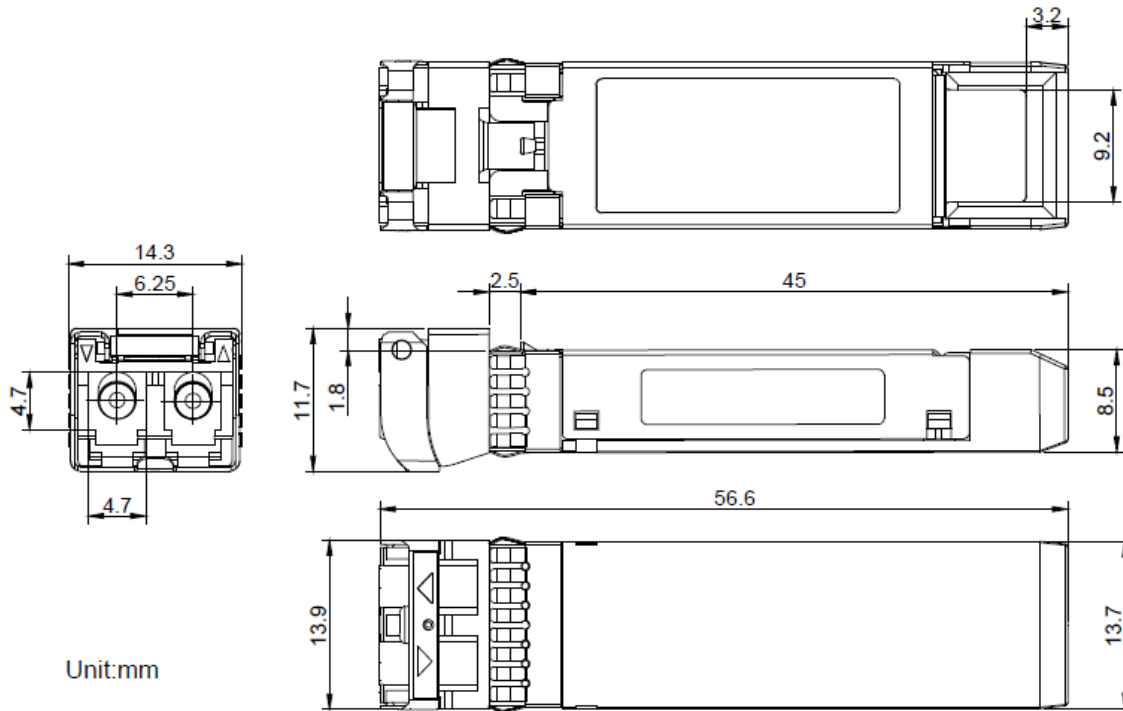
| Parameter                  | Symbol           | Min. | Typ. | Max. | Unit | Notes |
|----------------------------|------------------|------|------|------|------|-------|
| Sensitivity                | P <sub>min</sub> |      |      | -8.5 | dBm  | 6     |
| Stressed Sensitivity (OMA) |                  |      |      | -6.5 | dBm  |       |
| Central wavelength         | $\lambda_c$      | 1260 |      | 1355 | nm   |       |
| Receiver overload          | P <sub>MAX</sub> | 0    |      |      | dBm  | 6     |
| RX_LOS Asserted            | S <sub>A</sub>   | -30  |      |      | dBm  |       |
| RX_LOS De-Asserted         | S <sub>D</sub>   |      |      | -11  | dBm  |       |
| RX_LOS Hysteresis          | -                |      | 3.0  |      | dB   |       |
| Optical return loss        | ORL              | 12   |      |      | dB   |       |

### Notes:

1. Internally AC coupled and terminated to 100Ω differential load.
2. Internally AC coupled, but requires a 100Ω differential termination or internal to Serializer/Deserializer.
3. It is open collector/drain output which should be pulled up externally to V<sub>CC</sub> with a 4.7KΩ-10KΩ resistor on the host board. LOS: logic 0 indicates normal operation; logic 1 indicates no signal detected.
4. Optical power is launched into MMF
5. 20-80%
6. Measured with PRBS 2<sup>31</sup>-1 at test pattern @10.3125Gbps.



## Mechanical specification



## Recommended environment conditions

| Parameter                                | Symbol          | Min   | Typ | Max   | Unit |
|--|-----------------|-------|-----|-------|------|
| Operating Temperature Range (industrial) | T               | -40   | -   | 85    | °C   |
| Operating Temperature Range (standard)   | T               | 0     | 25  | 70    | °C   |
| Supply Voltage                           | V <sub>CC</sub> | 3.135 | 3.3 | 3.465 | V    |
| Relative Humidity                        | RH              | 5     | -   | 95    | %    |

## Ordering information

FTF-M1XG-S31L-22MD- 1310nm, 220m, multi-mode, LC duplex, **DDMI**, commercial temperature (0~70°C)

FTF-M1XG-S31L-22MDI- 1310nm, 220m, multi-mode, LC duplex, **DDMI, extended temperature** (-40~85°C)

For further information regarding host device PCB layout recommendation, power supply requirements, EEPROM memory map, DDMI specification please check:

[SFF-8472 - Description of EEPROM and Digital Diagnostic Monitoring Interface](#) and [SFF-8431 - Technical specification for SFP+ transceiver](#)

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