

## SFP-MR-LR2



## Features

- Single 3.3 V supply
- 26dB min, 30.5 dB typical link budget
- -5 to 70 °C temperature operation
- 1550nm DFB laser
- APD Receiver
- SFP MSA SFF-8074i compliant
- GR 253/STM G.957 compliant
- Digital Diagnostic SFF-8472 compliant
- Bellcore GR-468 compliant
- White color coated bail latch

## General Operating

| Parameter                                 | Symbol   | Min.  | Typical | Max.  | Unit              |
|-------------------------------------------|----------|-------|---------|-------|-------------------|
| Supply Voltage                            | $V_{CC}$ | 3.135 | 3.3     | 3.465 | V                 |
| Total Current                             | $I_{CC}$ | -     | -       | 300   | mA                |
| Power Supply Noise Rejection <sup>a</sup> | PSR      | 100   | -       | -     | mV <sub>p-p</sub> |
| Operating Temperature (case)              | $T_{op}$ | -5    | -       | 70    | °C                |
| Storage Temperature                       | $T_{st}$ | -40   | -       | 85    | °C                |
| Data Rate                                 | DR       | 100   | -       | 2700  | Mbps              |

a) 20Hz to 155MHz

## Transmitter Specifications (Optical)

| Parameter                                   | Symbol          | Min  | Typical | Max   | Unit                             |
|---------------------------------------------|-----------------|------|---------|-------|----------------------------------|
| Optical Power                               | $P_{op}$        | -2   | 0.5     | 3     | dBm                              |
| Average Launch Power Of Off Tx              | $P_{off}$       | -    | -       | -30   | dBm                              |
| Extinction Ratio                            | ER              | 8.2  | -       | -     | dB                               |
| Eye Mask                                    |                 | -    | -       | -     | IEEE 802.3Z, SONET/SDH compliant |
| Optical Jitter Generation                   | $J_{gen}$       | -    | -       | 0.007 | UI                               |
| Optical Rise Time <sup>b</sup>              | $t_r$           | -    | -       | 160   | ps                               |
| Optical Fall Time <sup>b</sup>              | $t_f$           | -    | -       | 160   | ps                               |
| Mean Wavelength                             | $\lambda$       | 1500 | 1550    | 1580  | nm                               |
| Spectral Width (20dB)                       | $\Delta\lambda$ | -    | -       | 1     | nm                               |
| Dispersion Penalty (80 Km SMF) <sup>c</sup> | $dp$            | -    | 1       | 2     | dB                               |
| Relative Intensity Noise                    | RIN             | -    | -       | -120  | dB/Hz                            |
| Reflection Toleranced <sup>d</sup>          | $rp$            | -24  | -       | -     | dB                               |

b) 20%-80% values

c) Measured at BER of  $1e^{-10}$ , PRBS of  $2^{23}-1$ , at eye center

d) 1 dB degradation of receiver sensitivity

## SFP-MR-LR2

## Transmitter Specifications (Electrical)

| Parameter                          | Symbol       | Min      | Typical | Max          | Unit     |
|------------------------------------|--------------|----------|---------|--------------|----------|
| Input Differential Impedence       | $R_{in}$     | 80       | 100     | 120          | $\Omega$ |
| PECL Single Ended Data Input Swing | $V_{in,p-p}$ | 250      | -       | 1200         | mV       |
| TxFault_Fault                      | $V_{fault}$  | 2        | -       | $V_{cc}$     | V        |
| TxFault_Normal                     | $V_{normal}$ | $V_{ee}$ | -       | $V_{ee}+0.5$ | V        |
| TxDisable_Disable                  | $V_d$        | 2        | -       | $V_{cc}$     | V        |
| TxDisable_Enable                   | $V_{en}$     | $V_{ee}$ | -       | $V_{ee}+0.8$ | V        |

## Receiver Specifications

| Parameter                       | Symbol          | Min  | Typical | Max  | Unit |
|---------------------------------|-----------------|------|---------|------|------|
| Receive Power Low <sup>e</sup>  | $R_{sens,low}$  | -28  | -30     | -    | dBm  |
| Receive Power High              | $R_{sens,high}$ | -    | -       | -9   | dBm  |
| Damage Threshold For Receiver   | $P_{in,damage}$ | -    | -       | 4    | dBm  |
| Wavelength                      | $\lambda$       | 1200 | -       | 1625 | nm   |
| Maximum Reflectance Of Receiver | $RX_r$          | -    | -       | -27  | dB   |
| LOS Assert                      |                 | -38  | -       | -    | dBm  |
| LOS De-assert                   |                 | -    | -       | -28  | dBm  |
| LOS Hysteresis                  |                 | 0.5  | -       | -    | dB   |

e)  $10^{-10}$  BER, PRBS 2<sup>23</sup>-1 for SONET,  $10^{-12}$  BER, PRBS 2<sup>7</sup>-1 for Gigabit Ethernet

## Electrical Output

| Parameter                           | Symbol        | Min | Typical | Max | Unit |
|-------------------------------------|---------------|-----|---------|-----|------|
| PECL Single Ended Data Output Swing | $V_{out,p-p}$ | 300 | 400     | 600 | mV   |
| Data Output Rise Time               | $t_r$         | -   | -       | 175 | ps   |
| Data Output Fall Time               | $t_f$         | -   | -       | 175 | ps   |

## Timing and Electrical

| Parameter                                       | Symbol              | Min      | Typical | Max          | Unit    |
|-------------------------------------------------|---------------------|----------|---------|--------------|---------|
| Tx Disable Negate Time                          | $t_{on}$            | -        | -       | 1            | ms      |
| Tx Disable Assert Time                          | $t_{off}$           | -        | -       | 10           | $\mu$ s |
| Time To Initialize, Including Reset Of Tx Fault | $t_{init}$          | -        | -       | 300          | ms      |
| Tx Fault Assert Time                            | $t_{fault}$         | -        | -       | 100          | $\mu$ s |
| Tx Disable To Reset                             | $t_{reset}$         | 10       | -       | -            | $\mu$ s |
| LOS Assert Time                                 | $t_{loss_{on}}$     | -        | -       | 100          | $\mu$ s |
| LOS De-assert Time                              | $t_{loss_{off}}$    | -        | -       | 100          | $\mu$ s |
| Serial ID Clock Rate                            | $f_{serial\_clock}$ | -        | -       | 100          | KHz     |
| RX_LOS Voltage (High)                           |                     | 2        | -       | -            | V       |
| RX_LOS Voltage (Low)                            |                     | -        | -       | 0.8          | V       |
| LOS Output Voltage-Fault                        | $V_{LOS\ fault}$    | 2        | -       | $V_{cc}$     | V       |
| LOS Output Voltage-Normal                       | $V_{LOS\ normal}$   | $V_{ee}$ | -       | $V_{ee}+0.5$ | V       |
| MOD_DEF (0:2)-High                              | $V_H$               | 2        | -       | $V_{cc}$     | V       |
| MOD_DEF (0:2)-Low                               | $V_L$               | $V_{ee}$ | -       | $V_{ee}+0.5$ | V       |

## SFP-MR-LR2

## Diagnostics

| Parameter    | Range         | Accuracy | Unit | Calibration | Formula                                                                                               |
|--------------|---------------|----------|------|-------------|-------------------------------------------------------------------------------------------------------|
| Temperature  | -40 to 102    | ± 3      | ° C  | Internal    | $T_c(C) = T_{ad}(16 \text{ bit signed twos complement}) / 256$                                        |
| Voltage      | 0 to $V_{cc}$ | 0.1      | V    | Internal    | $V(\text{Volts}) = V_{ad}(16 \text{ bit unsigned integer}) * 0.1$                                     |
| Bias Current | 0 to 120      | 5        | mA   | External    | $I(\text{mA}) = I_{slope} * I_{ad}(16 \text{ bit unsigned integer}) + I_{offset}$                     |
| TX Power     | 0 to 3mW      | ±3 dB    | mW   | External    | $TX\_PWR(\mu W) = TX\_PWR_{slope} * TX\_PWR_{ad}(16 \text{ bit unsigned integer}) + TX\_PWR_{offset}$ |
| RX Power     | -28 to -9 dBm | ±3 dB    | mW   | External    | $RX\_PWR(\mu W) = A0 + A1 * x + A2 * x^2 + A3 * x^3 + A4 * x^4$                                       |

## EEPROM Serial ID

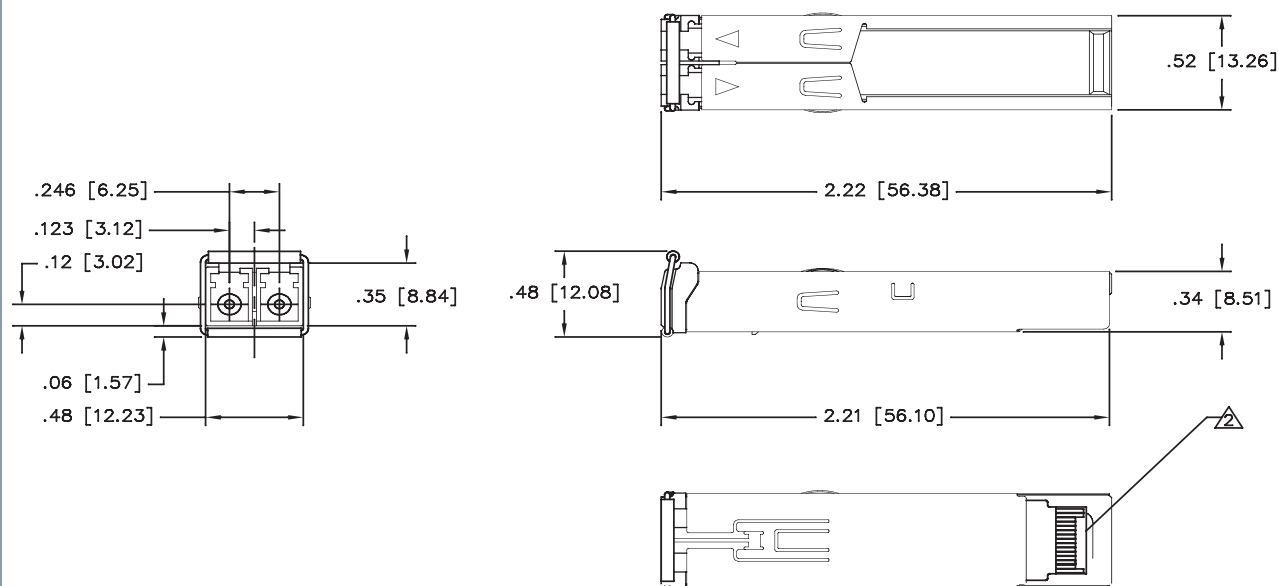
| Name of Field | Description of Field                      | Address | Hex | ASCII |
|---------------|-------------------------------------------|---------|-----|-------|
| Vendor Name   | SFP Vendor Name(ASCII)                    | 20      | 4C  | L     |
|               |                                           | 21      | 55  | U     |
|               |                                           | 22      | 4D  | M     |
|               |                                           | 23      | 49  | I     |
|               |                                           | 24      | 4E  | N     |
|               |                                           | 25      | 45  | E     |
|               |                                           | 26      | 4E  | N     |
|               |                                           | 27      | 54  | T     |
| Vendor OUI    | IEEE Vendor OUI Code For LuminentOIC Inc. | 37      | 00  |       |
|               |                                           | 38      | 06  |       |
|               |                                           | 39      | B5  |       |
| Vendor PN     | Part Number in ASCII, e.g.<br>SFP-MR-LR2  | 40      | 53  | S     |
|               |                                           | 41      | 46  | F     |
|               |                                           | 42      | 50  | P     |
|               |                                           | 43      | 4D  | M     |
|               |                                           | 44      | 52  | R     |
|               |                                           | 45      | 4C  | L     |
|               |                                           | 46      | 52  | R     |
|               |                                           | 47      | 32  | 2     |

## SFP-MR-LR2

| Pin | Function          | Notes                  |
|-----|-------------------|------------------------|
| 1   | V <sub>ee</sub> T | TX GND                 |
| 2   | TX_FAULT          | Open Collector         |
| 3   | TX_DISABLE        | Internally Pulled High |
| 4   | MOD_DEF2          | Serial Data Input      |
| 5   | MOD_DEF1          | Serial Clock Input     |
| 6   | MOD_DEF0          | Internally Grounded    |
| 7   | NC                | Not Connected          |
| 8   | LOS               | Open Collector         |
| 9   | V <sub>ee</sub> R | RX Ground              |
| 10  | V <sub>ee</sub> R | RX Ground              |
| 11  | V <sub>ee</sub> R | RX Ground              |
| 12  | RXD-              | RX Data Negative       |
| 13  | RXD+              | RX Data Positive       |
| 14  | V <sub>ee</sub> R | RX GND                 |
| 15  | V <sub>cc</sub> R | RX Power               |
| 16  | V <sub>cc</sub> T | TX Power               |
| 17  | V <sub>ee</sub> T | TX GND                 |
| 18  | TXD+              | TX Data Positive       |
| 19  | TXD-              | TX Data Negative       |
| 20  | V <sub>ee</sub> T | TX GND                 |

### Outline Drawing

Units in inches [mm]



## SFP-MR-LR2

## Ordering Information

## Available Options:

SFP-MR-LR2

SFP-MR-LR2-D1

## Part numbering Definition:

SFP-MR-LR2

-

Digital Diagnostics

-

Customer Specific

- Blank=No Diagnostic
- D1= External Calibration
- D2= Internal Calibration

- Labelling, Serial number, or Shipping Instructions etc.

## Warnings:

**Handling Precautions:** This device is susceptible to damage as a result of electrostatic discharge (ESD). A static free environment is highly recommended. Follow guidelines according to proper ESD procedures.

**Laser Safety:** Radiation emitted by laser devices can be dangerous to human eyes. Avoid eye exposure to direct or indirect radiation.

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