

## SFP-MR-LR-xx



## Features

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

## 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 <sub>gen</sub>	-	-	0.002	UI
Optical Rise Time <sup>b</sup>	$t_r$	-	-	160	ps
Optical Fall Time <sup>b</sup>	$t_f$	-	-	160	ps
Mean Wavelength	$\lambda$	1xxx-6.5nm	1xxx	1xxx+6.5nm	nm
Spectral Width (20dB)	$\Delta\lambda$	-	-	1	nm
Dispersion Penalty (60 Km) <sup>c</sup>	dp	-	1	2	dB
Relative Intensity Noise	RIN	-	-	-120	dB/Hz
Reflection Tolerance <sup>d</sup>	rp	-24	-	-	dB

b) 20%-80% values

c) Measured at BER of  $1e^{-12}$ , PRBS of 2<sup>23</sup>-1, at eye center

d) 1 dB degradation of receiver sensitivity

## SFP-MR-LR-xx

## Transmitter Specifications (Electical)

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	$R_{sens,high}$	-	-	-6	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		1	-	-	dB

e)  $10^{-10}$  BER, PRBS 2<sup>23</sup>-1 for SONET,  $10^{-12}$  BER, PRBS 27-1 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-LR-xx

### λ Wavelength Ordering

#### SFP-MR-LR-xx

See table below for "XX" values

### λ<sub>c</sub> Wavelength Guide

Code	λ <sub>c</sub>	Unit	Code	λ <sub>c</sub>	Unit	Code	λ <sub>c</sub>	Unit	Code	λ <sub>c</sub>	Unit
31	1310	nm	39	1390	nm	47	1470	nm	55	1550	nm
33	1330	nm	41	1410	nm	49	1490	nm	57	1570	nm
35	1350	nm	43	1430	nm	51	1510	nm	59	1590	nm
37	1370	nm	45	1450	nm	53	1530	nm	61	1610	nm

### Diagnostics

Parameter	Range	Accuracy	Unit	Calibration	Formula
Temperature	-5 to 70	± 3	°C	Internal	$T_c(C) = T_{ad}(16 \text{ bit signed twos complement})/256$
Voltage	0 to V <sub>CC</sub>	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 0.5	±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 -6 dBm	±3 dB	mW	External	$RX\_PWR(\mu W) = A_0 + A_1 * x + A_2 * x^2 + A_3 * x^3 + A_4 * x^4$

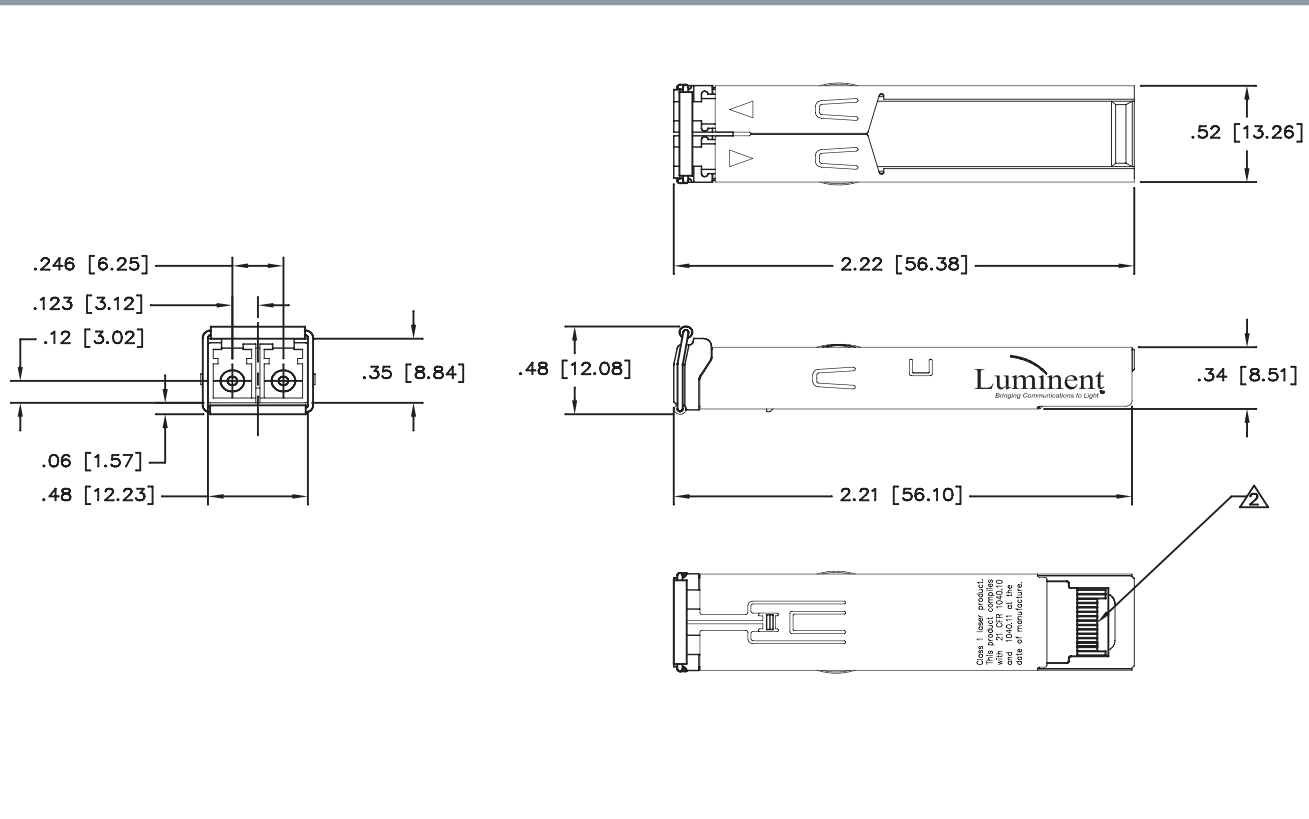
**SFP-MR-LR-xx**

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. SFP-MR-LR-xx	40	53	S
		41	46	F
		42	50	P
		43	4D	M
		44	52	R
		45	4C	L
		46	52	R
		47	x	x
48	x	x		

## SFP-MR-LR-xx

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



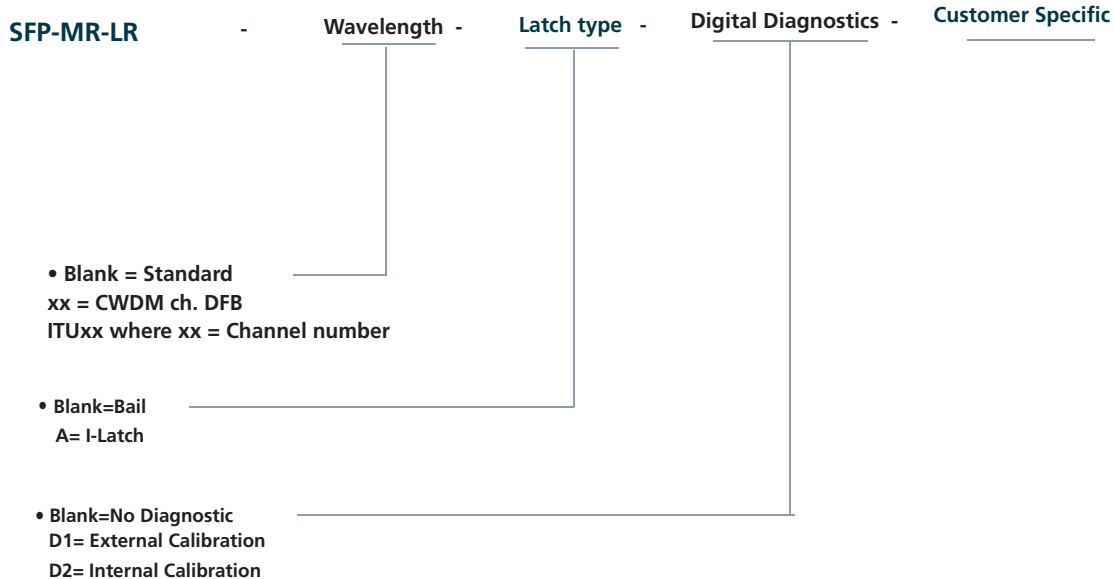
SFP-MR-LR-xx

Ordering Information

Available Options:

- SFP-MR-LR-xx
- SFP-MR-LR-xx-D1

Part numbering Definition:



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.

Legal Notes:

**IMPORTANT NOTICE!**

All information contained in this document is subject to change without notice, at LuminentOIC's sole and absolute discretion. LuminentOIC warrants performance of its products to current specifications only in accordance with the company's standard one-year warranty; however, specifications designated as "preliminary" are given to describe components only, and LuminentOIC expressly disclaims any and all warranties for said products, including express, implied, and statutory warranties, warranties of merchantability, fitness for a particular purpose, and non-infringement of proprietary rights. Please refer to the company's Terms and Conditions of Sale for further warranty information.

LuminentOIC assumes no liability for applications assistance, customer product design, software performance, or infringement of patents, services, or intellectual property described herein. No license, either express or implied, is granted under any patent right, copyright, or intellectual property right, and LuminentOIC makes no representations or warranties that the product(s) described herein are free from patent, copyright, or intellectual property rights. Products described in this document are NOT intended for use in implantation or other life support applications where malfunction may result in injury or death to persons. LuminentOIC customers using or selling products for use in such applications do so at their own risk and agree to fully defend and indemnify LuminentOIC for any damages resulting from such use or sale.

THE INFORMATION CONTAINED IN THIS DOCUMENT IS PROVIDED ON AN "AS IS" BASIS. Customer agrees that LuminentOIC is not liable for any actual, consequential, exemplary, or other damages arising directly or indirectly from any use of the information contained in this document. Customer must contact LuminentOIC to obtain the latest version of this publication to verify, before placing any order, that the information contained herein is current.

© LuminentOIC, Inc. 2003  
All rights reserved