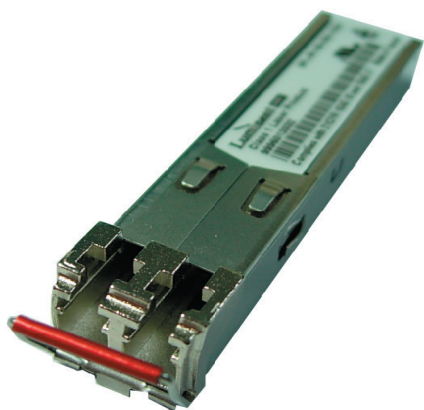


SP-MR-LR1



Features

- Single 3.3 V supply
- 40 km reach
- 25dB minimum, 29.5 dB typical link budget
- Commercial Temperature Available (-Cxx)
- Reduced Industrial Temperature Available (-Rxx)
- Industrial Temperature Available (-Txx)
- 1310nm DFB laser
- APD Receiver
- SFP MSA SFF-8074i compliant
- GR 253/STM G.957 compliant
- Digital Diagnostic SFF-8472 Rev. 9.4 compliant
- Telcordia GR-468 compliant
- Color coded bail latch: Red
- RoHS compliant

General Operating

Parameter	Symbol	Min.	Typical	Max.	Unit
Supply Voltage	V_{cc}	3.135	3.3	3.465	V
Total Current, -40 to -5°C ^a	I_{cc}	-	-	500	mA
Total Current, -5 to 85°C	I_{cc}	-	-	300	mA
Power Supply Noise Rejection ^b	PSR	100	-	-	mV _{p-p}
Operating Temperature(-Cxx)	T_{op}	-5	-	70	°C
Operating Temperature(-Rxx)	T_{op}	-20	-	85	°C
Operating Temperature(-Txx)	T_{op}	-40	-	85	°C
Storage Temperature	T_{st}	-40	-	85	°C
Data Rate	DR	100	-	2700	Mbps

a) Denotes deviation from MSA

b) 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}	-	-	-45	dBm
Extinction Ratio	ER	8.2	-	-	dB
Eye Mask			IEEE 802.3ah, SONET/SDH compliant		
Optical Jitter Generation	Jgen	-	-	0.007	UI
Optical Rise Time ^c	t_r	-	-	160	ps
Optical Fall Time ^c	t_f	-	-	160	ps
Mean Wavelength	λ	1280	1310	1335	nm
Spectral Width (20dB)	$\Delta\lambda$	-	-	1	nm
Relative Intensity Noise	RIN	-	-	-120	dB/Hz
Reflection Toleranced ^d	rp	-12	-	-	dB

c) 20%-80% values

d) 1 dB degradation of receiver sensitivity

SP-MR-LR1

Transmitter Specifications (Electrical)

Parameter	Symbol	Min	Typical	Max	Unit
Input Differential Impedence	R_{in}	80	100	120	Ω
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 ^e	$R_{sens,low}$	-	-29	-27	dBm
Receive Power High ^e	$R_{sens,high}$	-9	-	-	dBm
Damage Threshold For Receiver	$P_{in,damage}$	4	-	-	dBm
Wavelength	λ	1200	-	1625	nm
Maximum Reflectance Of Receiver	RX_r	-	-	-27	dB
LOS Assert		-42	-	-	dBm
LOS De-assert		-	-	-28	dBm
LOS Hysteresis		0.5	-	-	dB

e) 10^{-10} BER, PRBS 2²³-1 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	$V_{out,p-p}$	185	-	800	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	μ s
Time To Initialize, Including Reset Of Tx Fault	t_{init}	-	-	300	ms
Tx Fault Assert Time	t_{fault}	-	-	100	μ s
Tx Disable To Reset	t_{reset}	10	-	-	μ s
LOS Assert Time	$t_{loss,on}$	-	-	100	μ s
LOS De-assert Time	$t_{loss,off}$	-	-	100	μ 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

SP-MR-LR1

Diagnostics

Parameter	Range	Accuracy	Unit	Calibration	Formula
Temperature(-CDx)	-5 to 70	± 3	° C	External	$T_c(C) = T_{slope} * T_{ad}(16 \text{ bit signed twos complement value}) + T_{offset}$
Temperature(-RDx)	-20 to 85	± 3	° C	External	$T_c(C) = T_{slope} * T_{ad}(16 \text{ bit signed twos complement value}) + T_{offset}$
Temperature(-TDx)	-40 to 85	± 3	° C	External	$T_c(C) = T_{slope} * T_{ad}(16 \text{ bit signed twos complement value}) + T_{offset}$
Voltage	0 to V_{CC}	0.1	V	External	$V(\text{Volts}) = V_{slope} * V_{ad} (16 \text{ bit unsigned integer}) + V_{offset}$
Bias Current	0 to 120	5	mA	External	$I(\text{mA}) = I_{slope} * I_{ad}(16 \text{ bit unsigned integer}) + I_{offset}$
TX Power	-2 to 3	±3 dB	dBm	External	$TX_PWR(\mu W) = TX_PWR_{slope} * TX_PWR_{ad}(16 \text{ bit unsigned integer}) + TX_PWR_{offset}$
RX Power	-27 to -9	±3 dB	dBm	External	$RX_PWR(\mu W) = A_0 + A_1 * x + A_2 * x^2 + A_3 * x^3 + A_4 * x^4$

EEPROM Serial ID

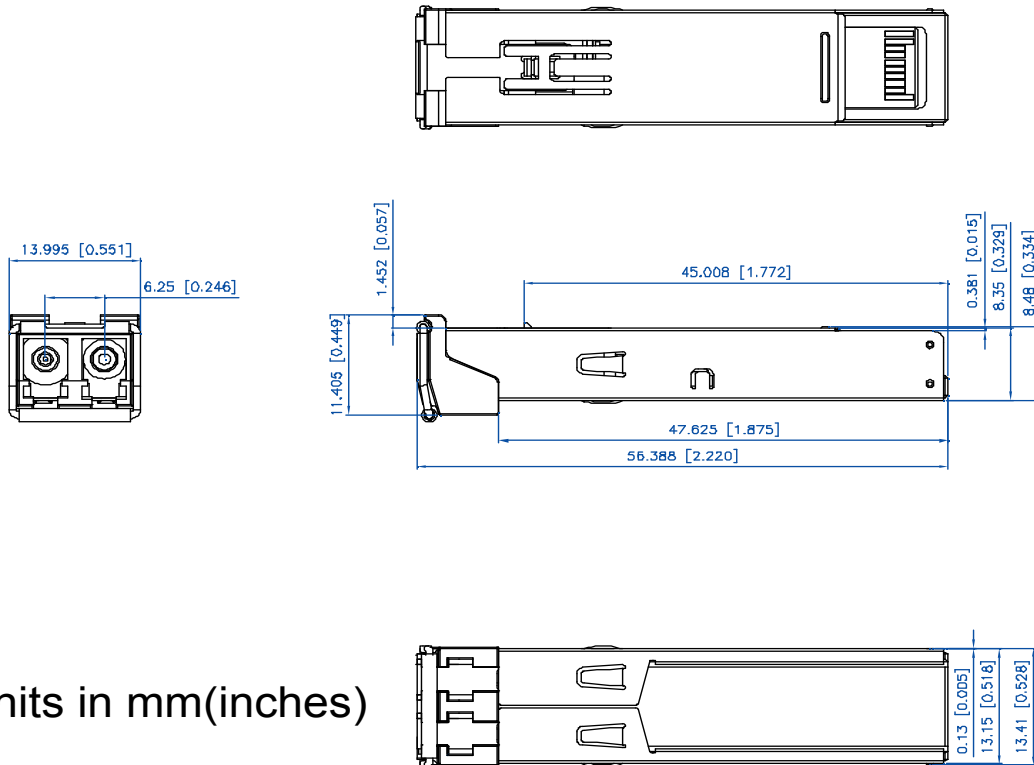
Name of Field	Description of Field	Address	Hex	ASCII
Vendor Name	SFP Vendor Name(ASCII)	20	4C	L
		21	55	U
		22	4D	M
		23	49	I
		24	4E	N
		25	45	E
		26	4E	N
		27	54	T
		28	4F	O
		29	49	I
		30	43	C
Vendor OUI	IEEE Vendor OUI Code For LuminentOIC Inc.	37	00	
		38	06	
		39	B5	
Vendor PN	Part Number in ASCII, e.g. SP-MR-LR1-CDA	40	53	S
		41	50	P
		42	4D	M
		43	52	R
		44	4C	L
		45	52	R
		46	31	1
		47	43	C
		48	44	D
		49	41	A

SP-MR-LR1

Pin	Function	Notes
1	V _{ee} 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 _{ee} R	RX Ground
10	V _{ee} R	RX Ground
11	V _{ee} R	RX Ground
12	RXD-	RX Data Negative
13	RXD+	RX Data Positive
14	V _{ee} R	RX GND
15	V _{cc} R	RX Power
16	V _{cc} T	TX Power
17	V _{ee} T	TX GND
18	TXD+	TX Data Positive
19	TXD-	TX Data Negative
20	V _{ee} T	TX GND

SP-MR-LR1

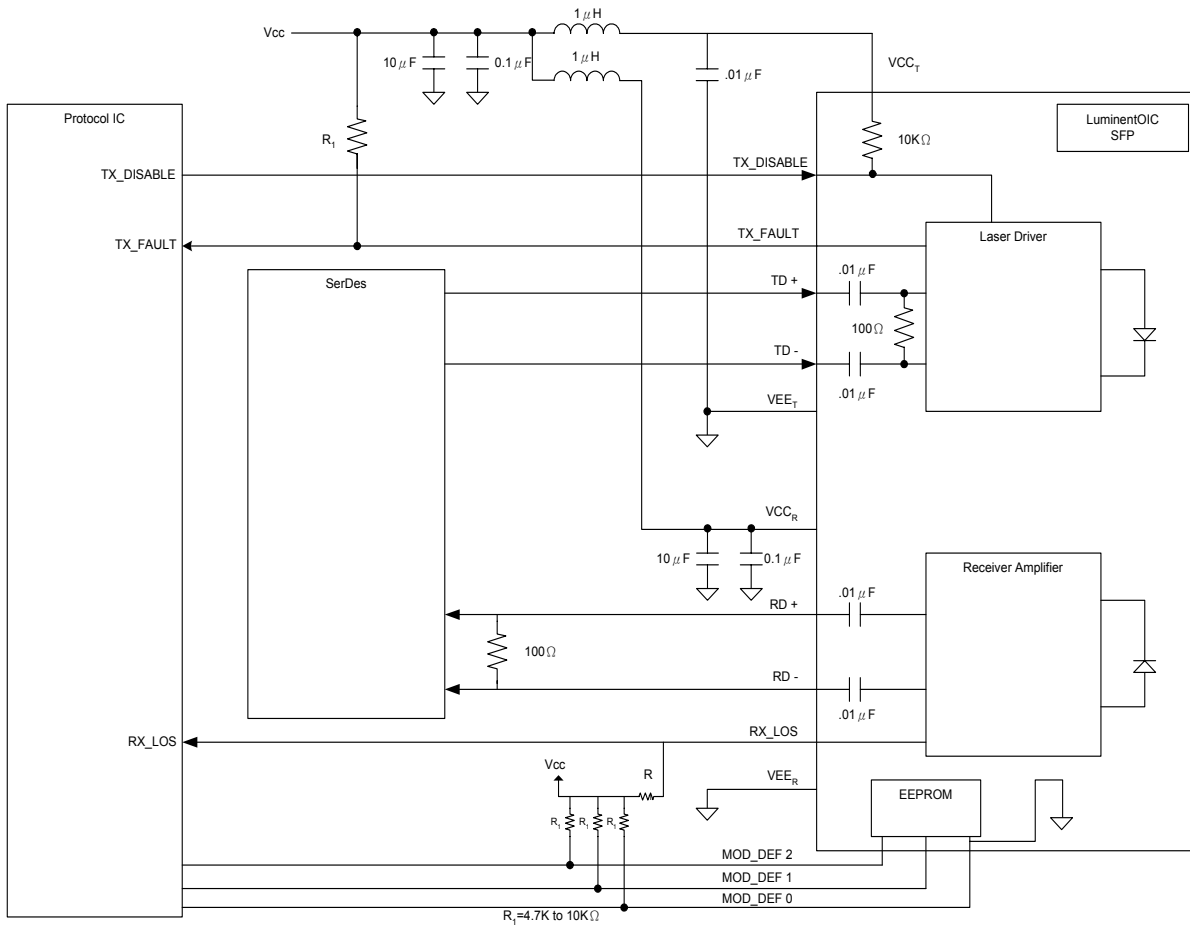
Outline Drawing



Units in mm(inches)

SP-MR-LR1

Suggested Transceiver Interface



SP-MR-LR1

Ordering Information

Available Options:

- | | |
|---------------|---------------|
| SP-MR-LR1-CDA | SP-MR-LR1-TDA |
| SP-MR-LR1-CNA | SP-MR-LR1-TNA |
| SP-MR-LR1-RDA | |
| SP-MR-LR1-RNA | |

Part numbering Definition:

SP - MR - LR1 - Temperature Diagnostic Revision

- SP = Small Form Pluggable
- MR = Multi Rate
- LR1 = Long Reach 40 km
- Operating Temperature
 - C = Commercial (-5 to 70°C)
 - R = Reduced Industrial (-20 to 85°C)
 - T = Industrial temperature (-40 to 85°C),
- D = Digital Diagnostic (SFF-8472)
- N = No Digital Diagnostic
- Design Revision
 - A = RoHS compliant

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:

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