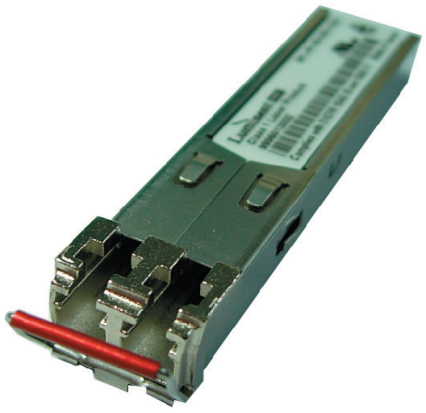
Multi-Rate SFP Transceiver(LR1)

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]	Icc	-	-	500	mA
Total Current, -5 to 85°C	Icc	-	-	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)	Δλ	-	-	1	nm
Relative Intensity Noise	RIN	-	-	-120	dB/Hz
Reflection Tolerance[d]	rp	-12	-	-	dB

c) 20%-80% values
d) 1 dB degradation of receiver sensitivity

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Transmitter Specifications (Electical)

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	Vd	2	-	V_{cc}	V
TxDisable_Enable	Ven	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 2^{23}-1 for SONET, 10^{-12} BER, PRBS 2^{7}-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	µs
Time To Initialize, Including Reset Of Tx Fault	t_init	-	-	300	ms
Tx Fault Assert Time	t_fault	-	-	100	µs
Tx Disable To Reset	t_reset	10	-	-	µs
LOS Assert Time	t_loss_on	-	-	100	µs
LOS De-assert Time	t_loss_off	-	-	100	µs
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

Diagnostics

Parameter	Range	Accuracy	Unit	Calibration	Formula
Temperature(-CDx)	-5 to 70	± 3	° C	External	Tc(C) = Tslope*Tad(16 bit signed twos complement value) + Toffset
Temperature(-RDx)	-20 to 85	± 3	° C	External	Tc(C) = Tslope*Tad(16 bit signed twos complement value) + Toffset
Temperature(-TDx)	-40 to 85	± 3	° C	External	Tc(C) = Tslope*Tad(16 bit signed twos complement value) + Toffset
Voltage	0 to V_{CC}	0.1	V	External	V(Volts) = Vslope*Vad (16 bit unsigned integer) + Voffset
Bias Current	0 to 120	5	mA	External	I(mA)=Islope*Iad(16 bit unsigned integer)+Ioffset
TX Power	-2 to 3	±3 dB	dBm	External	TX_PWR(μW)=TX_PWRslope*TX_PWRad(16 bit unsigned integer +TX_PWRoffset
RX Power	-27 to -9	±3 dB	dBm	External	RX_PWR(μW)=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
		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

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_{ccR}	RX Power
16	V_{ccT}	TX Power
17	$V_{ee}T$	TX GND
18	TXD+	TX Data Positive
19	TXD-	TX Data Negative
20	$V_{ee}T$	TX GND

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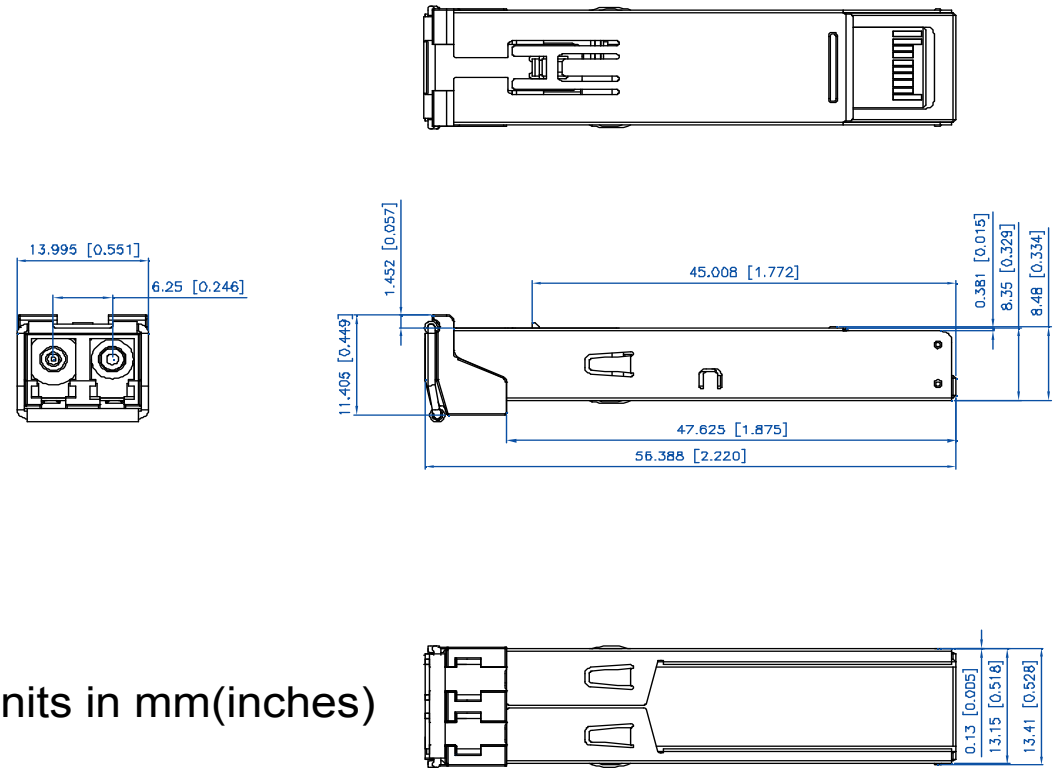
Outline Drawing



Units in mm(inches)

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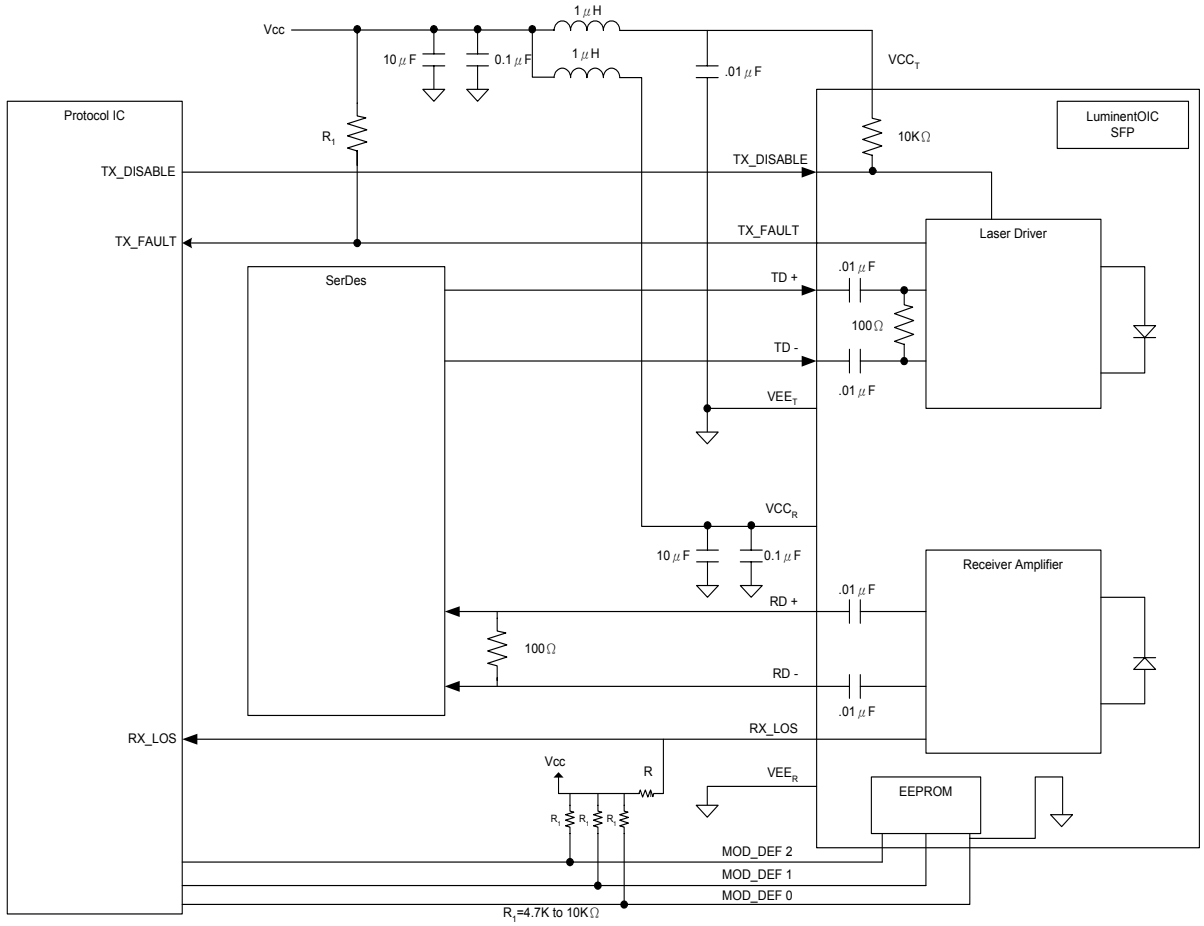
Suggested Transceiver Interface



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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