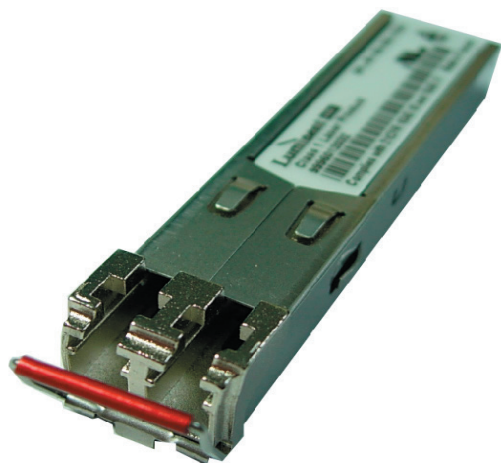


## SP-48-LR1



## Features

- Compliant with OC48/STM-16 Standards
- Single 3.3 V supply
- 40 km reach
- 25 dB min, 29.5 dB typical link budget
- Commercial Temperature Available (-CxA)
- Industrial Temperature Available (-TxA)
- Reduced Temperature Available (-RxA)
- 1310nm DFB Laser
- APD receiver
- SFP MSA SFF-8074i compliant
- GR 253/STM G.957 compliant
- Telcordia GR-468 compliant
- Digital Diagnostic SFF-8472 Rev. 9.3 compliant
- Color code Bail Latch : Red
- RoHS compliant

## General Operating

Parameter	Symbol	Min.	Typ.	Max.	Unit
Supply Voltage	V <sub>cc</sub>	3.135	3.3	3.465	V
Total Current	I <sub>cc</sub>	-	-	300	mA
Power Supply Noise Rejection <sup>a</sup>	PSR	100	-	-	mVp-p
Operating Temperature(-CDA)	T <sub>op</sub>	-5	-	70	°C
Operating Temperature(-RDA)	T <sub>op</sub>	-20	-	85	°C
Operating Temperature(-TDA)	T <sub>op</sub>	-40	-	85	°C
Storage Temperature	T <sub>stg</sub>	-40	-	85	°C
Data Rate OC48/STM-16	DR	-	2488.32	-	Mbps

a) 20Hz to 155MHz

## Transmitter Specifications, Optical

Parameter	Symbol	Min	Typical	Max	Unit
Optical Power	P <sub>op</sub>	-2	0.5	3	dBm
Average Launch Power of Off Tx	P <sub>off</sub>	-	-	-30	dBm
Extinction Ratio	ER	8.2	-	-	dB
Eye Mask	SONET/SDH compliant				
Optical Jitter Generation	J <sub>gen</sub>	-	-	0.007	UI
Optical Rise Time <sup>b</sup>	t <sub>r</sub>	-	-	160	ps
Optical Fall Time <sup>b</sup>	t <sub>f</sub>	-	-	160	ps
Mean Wavelength	λ	1280	1310	1335	nm
Spectral Width (20dB)	Δλ	-	-	1	nm
Dispersion Penalty (40Km) <sup>c</sup>	dp	-	-	1	dB
Relative Intensity Noise	RIN	-	-	-120	dB/Hz
Reflectance Tolerance <sup>d</sup>	rp	-24	-	-	dB

b) 20%-80% values

c) Measured at BER of 1e-10, PRBS of 2<sup>23</sup>-1, at eye center

d) 1dB degradation of receiver sensitivity

## SP-48-LR1

## 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, Optical

Parameter	Symbol	Min	Typical	Max	Unit
Receiver Power Low <sup>e</sup>	$R_{sens,low}$	-	-29	-27	dBm
Receiver Power High <sup>e</sup>	$R_{sens,high}$	-6	-	-	dBm
Damage Threshold for Receiver	$P_{in, damage}$	4	-	-	dBm
Wavelength <sup>f</sup>	$\lambda$	1280	1310	1335	nm
Maximum Reflectance of Receiver	$RX_r$	-	-	-27	dB
LOS Assert	-	-42	-	-	dBm
LOS De-assert	-	-	-	-27	dBm
LOS Hysteresis	-	0.5	-	-	dB

e) At  $10^{-10}$  BER, PRBS 2<sup>23</sup>-1

f) Operational over 1200-1625 nm range

## 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	$\mu$ 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)	$Rx\_LOS_H$	2	-	-	V
RX_LOS Voltage (low)	$Rx\_LOS_L$	-	-	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

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Diagnostics

Parameter	Range	Accuracy	Unit	Calibration	Formula
Temperature (-CDA)	-5 to 70	±3	°C	External	$T_c(C) = T_{slope} * T_{ad}(16 \text{ bit signed twos complement value}) + T_{offset}$
Temperature (-RDA)	-20 to 85	±3	°C	External	$T_c(C) = T_{slope} * T_{ad}(16 \text{ bit signed twos complement value}) + T_{offset}$
Temperature (-TDA)	-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 Vcc	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	±3dB	dBm	External	$Tx\_PWR(\mu W) = Tx\_PWR_{slope} * Tx\_PWR_{ad}(16 \text{ bit unsigned integer}) + Tx\_PWR_{offset}$
Rx Power	-31 to -6	±3dB	dBm	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	SFPVendor 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-48-LR1-CDA	40	53	S
		41	50	P
		42	34	4
		43	38	8
		44	4C	L
		45	52	R
		46	31	1
		47	43	C
		48	44	D
		49	41	A

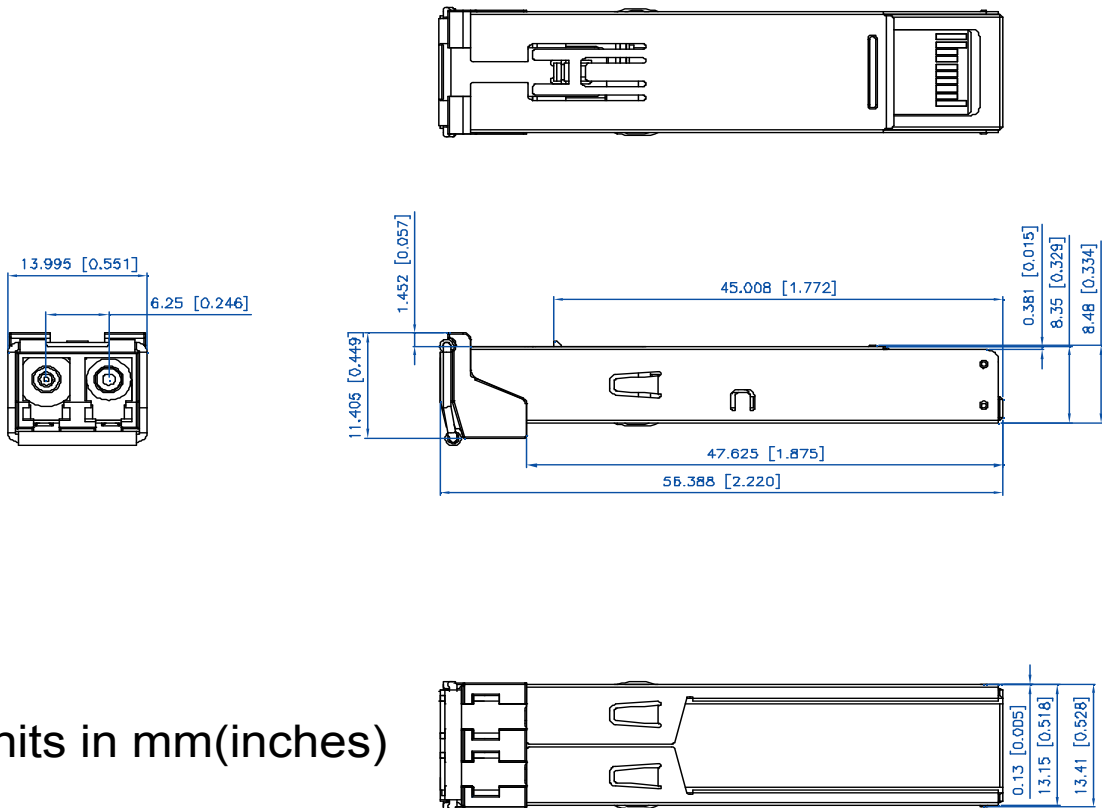
## SP-48-LR1

## Pinout Definitions

Pin	Function	Notes
1	V <sub>eeT</sub>	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>eeR</sub>	RX Ground
10	V <sub>eeR</sub>	RX Ground
11	V <sub>eeR</sub>	RX Ground
12	RXD-	RX Data Negative
13	RXD+	RX Data Positive
14	V <sub>eeR</sub>	RX GND
15	V <sub>CCR</sub>	RX Power
16	V <sub>CCT</sub>	TX Power
17	V <sub>eeT</sub>	TX GND
18	TXD+	TX Data Positive
19	TXD-	TX Data Negative
20	V <sub>eeT</sub>	TX GND

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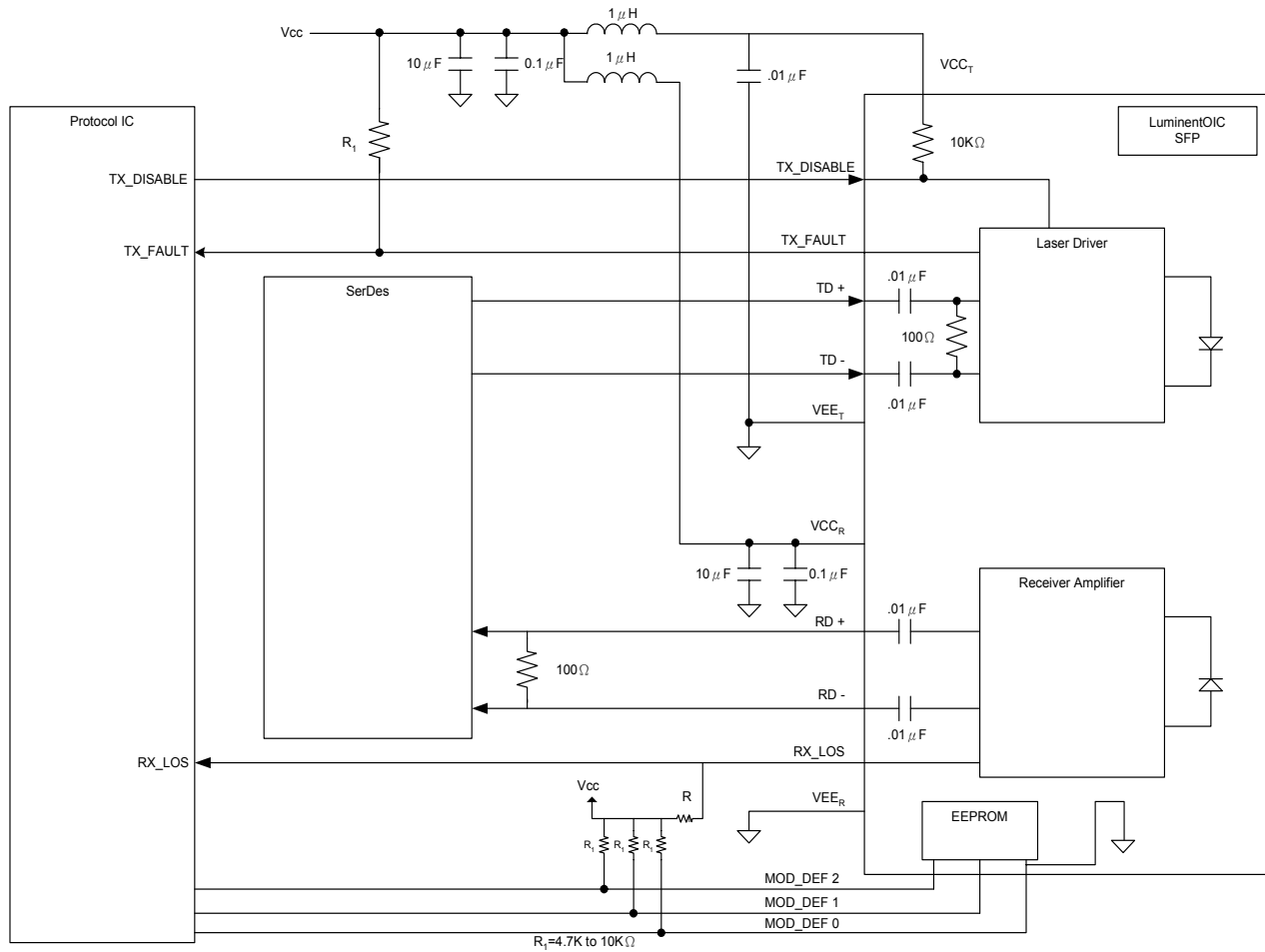
Outline Drawing



Units in mm(inches)

SP-48-LR1

Suggested Transceiver Interface



SP-48-LR1

Ordering Information

Available Options:

SP-48-LR1-CDA	SP-48-LR1-CNA
SP-48-LR1-TDA	SP-48-LR1-TNA
SP-48-LR1-RDA	SP-48-LR1-RNA

Part Numbering Definition:

SP - 03 - LR1 - Temperature Diagnostic Revision

- SP = Small Form Pluggable
- 48 = OC48
- LR1 = Long Reach 40 km
- Operatating Temperature
  - C= Commercial temperature (-5 to 70°C)
  - T= Industrial temperature (-40 to 85°C)
  - R = Reduced Industrial (-20 to 85°C)
- Diagnostic
  - D = Digital Diagnostic (SFF-8472)
  - N = No 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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