155 Mbps SFP Transceiver (LR1)

SP-03-LR1

Features

- **Single 3.3V Supply**
- **29dB Minimum Link Budget**
- **Commercial and Industrial Temperature Available**
- **1310nm FP Laser**
- **SFP MSA SFF-8074i Compliant**
- **GR-253/ITU-T G.957 Compliant**
- **IEEE 802.3ah Fast Ethernet Compliant**
- **Digital Diagnostic SFF-8472 Compliant**
- **Telcordia GR-468 Compliant**
- **Color coded bail latch: Grey**
- **RoHS compliant**

General Operation

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[a]	PSR	100	-	-	mV_{p-p}
Operating Temperature (-CxA)	T_{op}	-5	-	70	°C
Operating Temperature (-TxA)	T_{op}	-40	-	85	°C
Storage Temperature	T_{st}	-40	-	85	°C
Data Rate OC-3/STM-1	DR	125	155	-	Mbps

a) 20Hz to 155MHz

Transmitter Specifications

Parameter	Symbol	Min	Typical	Max	Unit
Optical Power	P_{OP}	-5	-2.5	0	dBm
Average Launch Power (Tx:Off)	P_{Off}	-	-	-45	dBm
Extinction Ratio	ER	10	-	-	dB
Eye Mask		SONET/SDH Compliant			
Optical Jitter Generation	Jgen	-	-	0.002	UI
Optical Rise Time[b]	t_r	-	-	2	ns
Optical Fall Time[b]	t_f	-		2	ns
Mean Wavelength	λ	1263	1310	1360	nm
Spectral Width (RMS)	Δλ	-	-	3	nm
Dispersion Penalty (40km)		-	0.5	1	dB
Relative Intensity Noise	RIN	-	-	-120	dB/Hz
Reflectance Tolerance	rp	-24	-	-	dB

b) 20%-80% values

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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	Vd	2	-	V_{cc}	V
TxDisable_Enable	Ven	V_{ee}	-	V_{ee}+0.8	V

Receiver Specifications (Optical)					
Parameter	**Symbol**	**Min**	**Typical**	**Max**	**Unit**
Receive Power Low[c]	$R_{sens,low}$	-	-36	-34	dBm
Receive Power High[c]	$R_{sens,high}$	-10	-	-	dBm
Damage Threshold For Receiver	$P_{in,damage}$	4	-	-	dBm
Wavelength[d]	λ	1263	1310	1360	nm
LOS Assert		-44	-	-	dBm
LOS De-Assert		-	-	-34	dBm
LOS Hysteresis		0.5	-	-	dB

c) at 10^{-10}, PRBS 2^{23}-1
d) Operational over 1200 to 1625nm range

Receiver Specifications (Electrical)					
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	-	-	2	ns
Data Output Fall Time	t_f	-	-	2	ns

Timing and Electrical					
Parameter	**Symbol**	**Min**	**Typical**	**Max**	**Unit**
Tx Disable Negate Time	t_on	-	-	25	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	-	-	300	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

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Diagnostics (SP-03-LR1-xDA)

Parameter	Range	Accuracy	Unit	Calibration	Formula
Temperature (-CDA)	-5 to 70	±3	°C	External	Tc(C) = Tslope*Tad(16 bit signed twos complement value) + Toffset
Temperature (-TDA)	-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	-5 to 0	±3dB	dBm	External	TX_PWR(µW)=TX_PWRslope*TX_PWRad(16 bit unsigned integer) +TX_PWRoffset
RX Power	-34 to -10	±3dB	dBm	External	RX_PWR(µW)=A0+A1*x+A2*x^2+A3*x^3+A4*x^4

Pinout Definitions

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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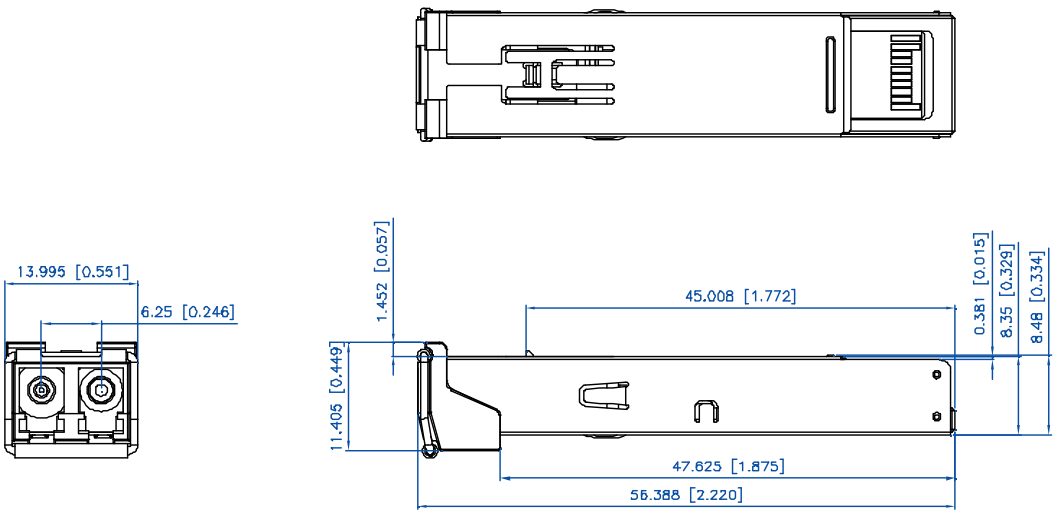
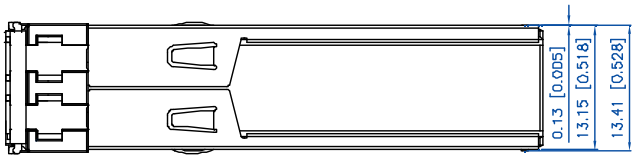
EEPROM Serial ID

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 P/N	Part number in ASCII, e.g. SP-03-LR1-CDA	40	53	S
		41	50	P
		42	30	0
		43	33	3
		44	4C	L
		45	52	R
		46	13	1
		47	43	C
		48	44	D
		49	41	A

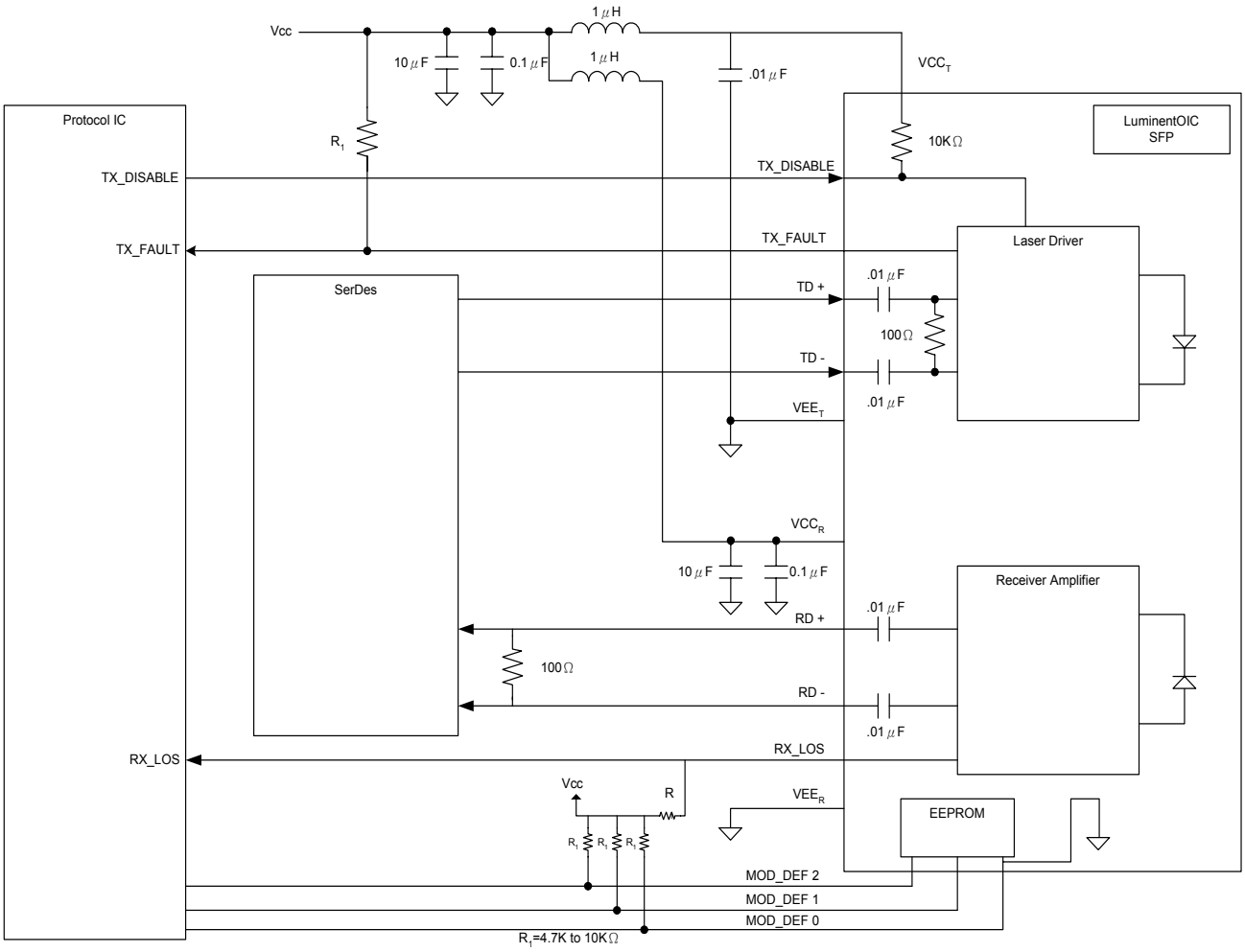
Outline drawing



Units in mm(inches)



Suggested Transceiver interface



Ordering Information

Available Options:
SP-03-LR1-CDA
SP-03-LR1-TDA
SP-03-LR1-CNA
SP-03-LR1-TNA

Part Numbering Definition:

S P - 0 3 - L R 1 - Temperature Diagnostic Revision

- **SP = Small Form Pluggable**
- **03 = OC-3/STM-1 (155 Mbps)**
- **LR1 = Long Reach 40km**

- **Operating Temperature**
  C = Commercial temperature (-5 to 70°C)
  T = Industrial temperature (-40 to 85°C)

- **D = Digital Diagnostic (SFF-8472)**
  N = No Digital Diagnostic

- **Ordering Information**
  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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