

## SP-GB-EX



## Features

- Data Rate 1.062 to 1.25 Gb/s
- Single 3.3V Supply
- 40km Reach
- 19 dB Minimum, 23.5dB Typical Link Budget
- Commercial or Industrial Temperature Operation
- 1310nm DFB Laser
- SFP MSA SFF-8074i Compatible
- Digital Diagnostic SFF-8472 Compatible
- Telcordia GR-468 Compliant
- RoHS-5 compliance (lead exemption)
- Color coded bail latch tube: Green

## 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 Rejection <sup>a</sup>	PSR	100	-	-	mV <sub>p-p</sub>
Operating Temperature (-CXX)	$T_{op}$	-5	-	70	°C
Operating Temperature (-TXX)	$T_{op}$	-40	-	85	°C
Storage Temperature	$T_{st}$	-40	-	85	°C
Data Rate GbE	DR	-	1250	-	Mbps
Data Rate FC	DR	-	1062.5	-	Mbps

a) 20Hz to 155MHz

## Transmitter Specifications (Optical)

Parameter	Symbol	Min	Typical	Max	Unit
Optical Power	POP	-5	-2.5	0	dBm
Average Launch Power (Tx:Off)	POff	-	-	-30	dBm
Extinction Ratio (Dynamic)	ER	9	-	-	dB
Eye Mask		IEEE802.3 compliant			
Total Jitter	TJ	-	-	200	ps
Optical Rise Time <sup>b</sup>	$t_r$	-	-	260	ps
Optical Fall Time <sup>b</sup>	$t_f$	-	-	260	ps
Mean Wavelength	$\lambda$	1260	1310	1360	nm
Spectral Width (20dB)	$\Delta\lambda$	-	-	1	nm
Side Mode Suppression Ratio	SMSR	30	-	-	dB
Optical Path Penalty at 40km <sup>c</sup>	dp	-	0.5	1	dB
Relative Intensity Noise	RIN	-	-	-120	dB/Hz
Reflection Tolerance <sup>d</sup>	rp	-12	-	-	dB

b) 20%-80% values

c) Measured at BER of  $10^{-12}$ , PRBS of 2<sup>7</sup>-1, at eye center

d) 1dB degradation of receiver sensitivity

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## Transmitter Specifications (Electrical)

Parameter	Symbol	Min	Typical	Max	Unit
Input Differential Impedance	$R_{in}$	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>	$R_{sens,low}$	-	-26	-24	dBm
Receive Power High	$R_{sens,high}$	-3	0	-	dBm
Damage Threshold For Receiver	$P_{in,damage}$	6	-	-	dBm
Wavelength	$\lambda$	1200	-	1625	nm
Receiver Reflectance	$RX_r$	-	-	-12	dB
LOS Assert		-45	-	-	dBm
LOS De-Assert		-	-	-24	dBm
LOS Hysteresis		0.5	-	-	dB

e)  $10^{-12}$  at nominal wavelength

## 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	$t_r$	-	-	260	ps
Data Output Fall Time	$t_f$	-	-	260	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	$f_{serial\_clock}$	2	-	100	KHz
RX_LOS Voltage (High)		2	-	$V_{cc}$	V
RX_LOS Voltage (Low)		-	-	0.8	V
Receiver Jitter Deterministic	JD, receive	-	-	170	ps
Receiver Jitter Random	JR, receive	-	-	96	ps
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
LOS Output Voltage-Fault	$V_{LOS\ fault}$	2	-	$V_{cc}$	V
LOS Output Voltage-Normal	$V_{LOSnormal}$	$V_{ee}$	-	$V_{ee}+0.5$	V

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Diagnostics					
Parameter	Range	Accuracy	Unit	Calibration	Formula
Temperature (-CDA)	-5 to 70	± 3	° C	Internal	$T_c(C) = T_{ad}(16 \text{ bit signed twos complement})/256$
Temperature (-TDA)	-40 to 85	± 3	° C	Internal	$T_c(C) = T_{ad}(16 \text{ bit signed twos complement})/256$
Voltage	0 to $V_{CC}$	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	-5 to 0	±3	dBm	External	$TX\_PWR(\mu W) = TX\_PWR_{slope} * TX\_PWR_{ad}(16 \text{ bit unsigned integer}) + TX\_PWR_{offset}$
RX Power	-24 to -3	±3	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 P/N	Part Number in ASCII, e.g. SP-GB-EX-CDA	40	53	S
		41	50	P
		42	47	G
		43	42	B
		44	45	E
		45	58	X
		46	43	C
		47	44	D
48	41	A		

## SP-GB-EX

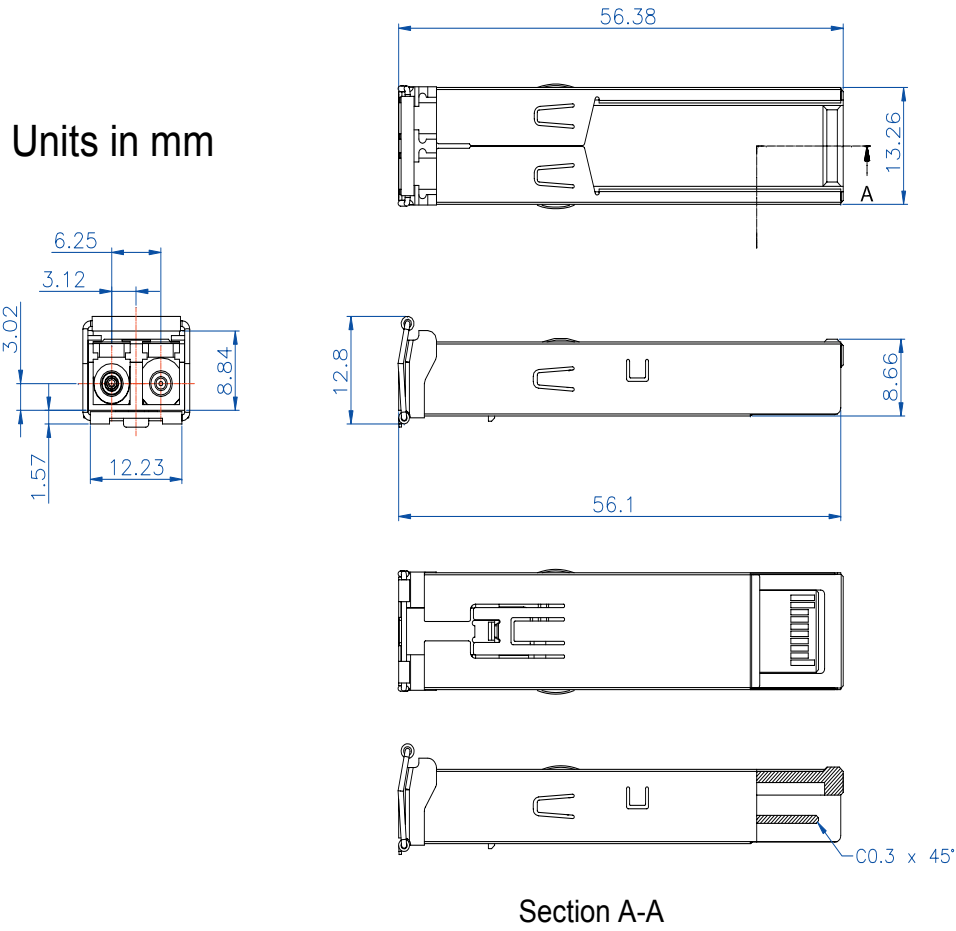
## Pinout Definitions

Pin	Function	Notes
1	$V_{eeT}$	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	$V_{eeR}$	RX Ground
10	$V_{eeR}$	RX Ground
11	$V_{eeR}$	RX Ground
12	RXD-	RX Data Negative
13	RXD+	RX Data Positive
14	$V_{eeR}$	RX GND
15	$V_{ccT,R}$	Tx and Rx Power*
16	$V_{ccH}$	Temperature Control Power*
17	$V_{eeT}$	TX GND
18	TXD+	TX Data Positive
19	TXD-	TX Data Negative
20	$V_{eeT}$	TX GND

\*denotes deviations from MSA standard

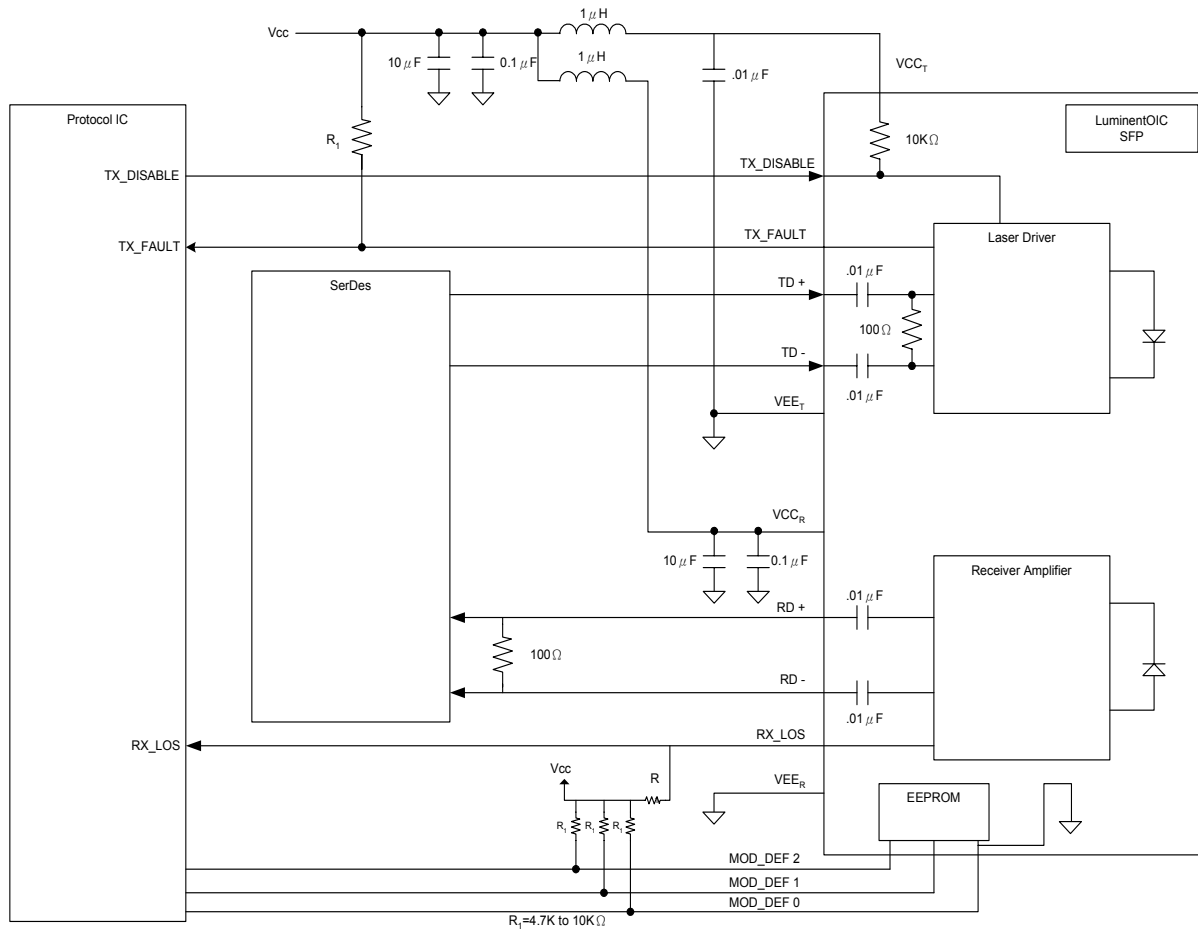
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Outline Drawing



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Suggested Transceiver Interface



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Ordering Information

Available Options:

- SP-GB-EX-CDA
- SP-GB-EX-CNA
- SP-GB-EX-TDA
- SP-GB-EX-TNA

Part numbering Definition:

SP - GB - EX - Temperature Diagnostic Revision

- SP = Small Form Pluggable  
GB = 1.25 Gbps  
EX = Intermediate Reach 40 km

- C = Commercial (-5 to 70°C)  
T = Industrial (-40 to 85°C)

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

- Design Revision

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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