

## EOLF-1312-X Series

**Single-Mode 1310nm 1.25G/1.063G for GBE/FC**  
**Duplex SFF Transceiver**  
**RoHS6 Compliant**

### Features

- ◆ Duplex LC Single-Mode Transceiver
- ◆ Operating Data Rate up to 1.25Gbps
- ◆ 10km with 9/125μm SMF  
 20km with 9/125μm SMF  
 30km with 9/125μm SMF  
 40km with 9/125μm SMF
- ◆ Single 3.3V Power supply
- ◆ LVPECL Signal Input/Output
- ◆ LVTTTL Transmitter Disable Input
- ◆ LVPECL/LVTTTL Signal Detect Output
- ◆ Small Form Factor 2X5 pin Package
- ◆ Class 1 FDA and IEC60825-1 Laser Safety Compliant
- ◆ Operating Case Temperature  
 Standard: 0°C~+70°C  
 Industrial: -40°C~+85°C



### Applications

- ◆ Gigabit Ethernet
- ◆ Fiber Channel Links
- ◆ Other Optical Links

### Ordering Information

Part No.	Input/output	SD	Fiber	Distance	Temp.
EOLF-1312-10*(note1)	AC/AC	TTL	SMF	10km	Standard
EOLF-1312-10-R	DC/DC	TTL	SMF	10km	Standard
EOLF-1312-20*(note1)	AC/AC	TTL	SMF	20km	Standard
EOLF-1312-20-R	DC/DC	TTL	SMF	20km	Standard
EOLF-1312-30*(note1)	AC/AC	TTL	SMF	30km	Standard
EOLF-1312-30-R	DC/DC	TTL	SMF	30km	Standard
EOLF-1312-40*(note1)	AC/AC	TTL	SMF	40km	Standard
EOLF-1312-40-R	DC/DC	TTL	SMF	40km	Standard

Note1: Standard version, for other ordering information in detail, please contact EOPTOLINK.

## Regulatory Compliance

Feature	Standard	Performance
Electrostatic Discharge (ESD) to the Electrical Pins	MIL-STD-883G Method 3015.7	Class 1C (>1000 V)
Electrostatic Discharge to the enclosure	EN 55024:1998+A1+A2 IEC-61000-4-2 GR-1089-CORE	Compliant with standards
Electromagnetic Interference (EMI)	FCC Part 15 Class B EN55022:2006 CISPR 22B :2006 VCCI Class B	Compliant with standards Noise frequency range: 30MHz to 6GHz. Good system EMI design practice required to achieve Class B margins. System margins are dependent on customer host board and chassis design.
Immunity	EN 55024:1998+A1+A2 IEC 61000-4-3	Compliant with standards. 1KHz sine-wave, 80% AM, from 80MHz to 1GHz. No effect on transmitter/receiver performance is detectable between these limits.
Laser Eye Safety	FDA 21CFR 1040.10 and 1040.11 EN (IEC) 60825-1:2007 EN (IEC) 60825-2:2004+A1	CDRH compliant and Class I laser product. TüV Certificate No. 50135086
Component Recognition	UL and CUL EN60950-1:2006	UL File E317337 TüV Certificate No. 50135086 (CB scheme )
RoHS6	2002/95/EC 4.1&4.2 2005/747/EC 5&7&13	Compliant with standards <sup>*note2</sup>

Note2: For update of the equipments and strict control of raw materials, EOPTOLINK has the ability to supply the customized products since Jan 1st, 2007, which meet the requirements of RoHS6 (Restrictions on use of certain Hazardous Substances) of European Union.

In light of item 5 in RoHS exemption list of RoHS Directive 2002/95/EC, Item 5: Lead in glass of cathode ray tubes, electronic components and fluorescent tubes.

In light of item 13 in RoHS exemption list of RoHS Directive 2005/747/EC, Item 13: Lead and cadmium in optical and filter glass. The three exemptions are being concerned for Eoptolink's transceivers, because Eoptolink's transceivers use glass, which may contain Pb, for components such as lenses, isolators, and other components.

## Product Description

The EOLF-1312-X series single-mode transceiver is small form factor, low power, high performance module for duplex optical data communications such as GBE, FE, SONET OC-3 / SDH STM-1 and OC-12 / STM-4. This module is designed for single-mode fiber and operates at a nominal wavelength of 1310nm.

The transmitter section uses a multiple quantum well laser and is a class 1 laser compliant with International Safety Standard IEC-60825. The receiver section uses an integrated InGaAs detector preamplifier (IDP) mounted in an optical header and a limiting post-amplifier IC. A LVPECL logic interface simplifies interface to external circuitry.

## Interface information

The Signal Detect (SD, active high), normal optical input of receiver represents to a logic “1” level, which means asserted.

The following versions are available:

1. AC/AC Transceiver

Tx and Rx are AC coupling. Tx has differential 100Ω load.

2. DC/DC Transceiver

Standard PECL inputs and outputs, Tx and Rx are AC coupling.

## Absolute Maximum Ratings

Parameter	Symbol	Min.	Max.	Unit
Storage Temperature	Ts	-40	+85	°C
Supply Voltage	Vcc	-0.5	3.6	V
Operating Relative Humidity		-	95	%

\*Exceeding any one of these values may destroy the device permanently.

## Recommended Operating Conditions

Parameter	Symbol	Min.	Typical	Max.	Unit
Operating Case Temperature	T <sub>c</sub>	EOLF-1312-X	0		+70
		EOLF-1312-X-i	-40		+85
Power Supply Voltage	Vcc	3.15	3.3	3.45	V
Power Supply Current	Icc			300	mA
Data Rate	GBE		1.25		Gbps
	FC		1.063		

## Performance Specifications - Electrical

Parameter	Symbol	Min.	Typ.	Max	Unit	Notes
<b>Transmitter</b>						

LVPECL Inputs(Differential)		Vin	400		2000	mVpp	AC Coupled Inputs <sup>*(note3)</sup>
Input Impedance (Differential)		Zin	85	100	115	ohm	Rin > 100 kohm @ DC
TX_Dis	Disable		2		Vcc+0.3	V	
	Enable		0		0.8		
TX_FAULT	Fault		2		Vcc+0.3	V	
	Normal		0		0.8		
<b>Receiver</b>							
LVPECL Outputs (Differential)		Vout	400		2000	mVpp	AC Coupled Outputs <sup>*(note3)</sup>
Output Impedance (Differential)		Zout	85	100	115	ohm	
RX_SD	Normal		-1.1		-0.74	V	
	SD		-2.0		-1.58	V	

## Optical and Electrical Characteristics

### (EOLF-1312-10 Series, 1310nm FP & PIN/TIA)

Parameter	Symbol	Min.	Typical	Max.	Unit
9µm Core Diameter SMF			10		km
Data Rate		1.063	1.25		Gbps
<b>Transmitter</b>					
Centre Wavelength	$\lambda_c$	1270	1310	1350	nm
Spectral Width (RMS)	$\Delta\lambda$			4	nm
Average Output Power <sup>*(note4)</sup>	Pout	-9		-3	dBm
Extinction Ratio <sup>*(note5)</sup>	ER	9			dB
Rise/Fall Time(20%~80%)	tr/tf			260	ps
Total Jitter <sup>*(note5)</sup>	TJ			1	ns
Output Optical Eye	Telcordia GR-253-CORE and ITU-T G.957 Compliant <sup>*(note7)</sup>				
TX_Disable Assert Time	t_off			10	us
<b>Receiver</b>					
Center Wavelength	$\lambda_c$	1260		1600	nm
Receiver Sensitivity <sup>*(note6)</sup>	Pmin			-21	dBm
Receiver Overload	Pmax	-3			dBm
Return Loss		14			dB
SD De-Assert	SDD	-45			dBm
SD Assert	SDA			-22	dBm
SD Hysteresis <sup>*(note8)</sup>		0.5			dB

### (EOLF-1312-20 Series, 1310nm FP & PIN/TIA)

Parameter	Symbol	Min.	Typical	Max.	Unit
9µm Core Diameter SMF			20		km

Data Rate		1.063	1.25		Gbps
<b>Transmitter</b>					
Centre Wavelength	$\lambda_c$	1270	1310	1350	nm
Spectral Width (RMS)	$\Delta\lambda$			4	nm
Average Output Power <sup>*(note4)</sup>	P <sub>out</sub>	-8		-3	dBm
Extinction Ratio <sup>*(note5)</sup>	ER	10			dB
Rise/Fall Time(20%~80%)	tr/tf			260	ps
Total Jitter <sup>*(note5)</sup>	TJ			1	ns
Output Optical Eye	Telcordia GR-253-CORE and ITU-T G.957 Compliant <sup>*(note7)</sup>				
TX_Disable Assert Time	t <sub>off</sub>			10	us
<b>Receiver</b>					
Center Wavelength	$\lambda_c$	1260		1600	nm
Receiver Sensitivity <sup>*(note6)</sup>	P <sub>min</sub>			-22	dBm
Receiver Overload	P <sub>max</sub>	-3			dBm
Return Loss		14			dB
SD De-Assert	SDD	-45			dBm
SD Assert	SDA			-23	dBm
SD Hysteresis <sup>*(note8)</sup>		0.5			dB

**(EOLF-1312-30 Series, 1310nm FP & PIN/TIA)**

Parameter	Symbol	Min.	Typical	Max.	Unit
9 $\mu$ m Core Diameter SMF			30		km
Data Rate		1.063	1.25		Gbps
<b>Transmitter</b>					
Centre Wavelength	$\lambda_c$		1310		nm
Spectral Width (RMS)	$\Delta\lambda$			4	nm
Average Output Power <sup>*(note4)</sup>	P <sub>out</sub>	-5		0	dBm
Extinction Ratio <sup>*(note5)</sup>	ER	10			dB
Rise/Fall Time(20%~80%)	tr/tf			260	ps
Total Jitter <sup>*(note5)</sup>	TJ			1	ns
Output Optical Eye	Telcordia GR-253-CORE and ITU-T G.957 Compliant <sup>*(note7)</sup>				
TX_Disable Assert Time	t <sub>off</sub>			10	us
<b>Receiver</b>					
Center Wavelength	$\lambda_c$	1260		1600	nm
Receiver Sensitivity <sup>*(note6)</sup>	P <sub>min</sub>			-24	dBm
Receiver Overload	P <sub>max</sub>	-3			dBm
Return Loss		14			dB
SD De-Assert	SDD	-45			dBm
SD Assert	SDA			-25	dBm
SD Hysteresis <sup>*(note8)</sup>		0.5			dB

## (EOLF-1312-40 Series, 1310nm DFB & PIN/TIA)

Parameter	Symbol	Min.	Typical	Max.	Unit
9μm Core Diameter SMF			40		km
Data Rate		1.063	1.25		Gbps
<b>Transmitter</b>					
Centre Wavelength	$\lambda_C$	1270	1310	1350	nm
Spectral Width (-20dB)	$\Delta\lambda$			1	nm
Average Output Power*(note4)	Pout	-2		+3	dBm
Extinction Ratio*(note5)	ER	10			dB
Rise/Fall Time(20%~80%)	tr/tf			260	ps
Total Jitter*(note5)	TJ			1	ns
Output Optical Eye	Telcordia GR-253-CORE and ITU-T G.957 Compliant*(note7)				
TX_Disable Assert Time	t_off			10	us
<b>Receiver</b>					
Center Wavelength	$\lambda_C$	1260		1600	nm
Receiver Sensitivity*(note6)	Pmin			-24	dBm
Receiver Overload	Pmax	-3			dBm
Return Loss		14			dB
SD De-Assert	SDD			-25	dBm
SD Assert	SDA	-45			dBm
SD Hysteresis*(note8)		0.5			dB

Note3: LVPECL logic, internally AC coupled.

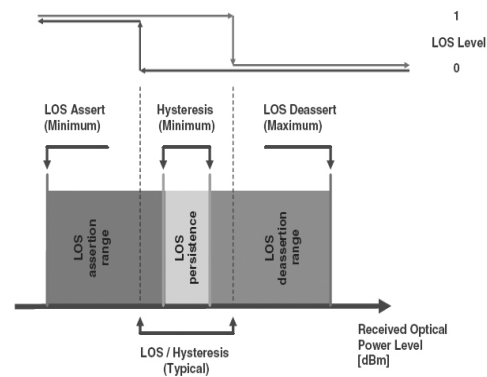
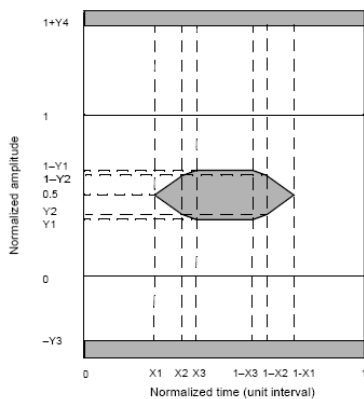
Note4: Output is measured by coupling into a 9/125μm single-mode fiber.

Note5: Filtered, measured with a PRBS 2<sup>7</sup>-1 test pattern @1.25Gbps.

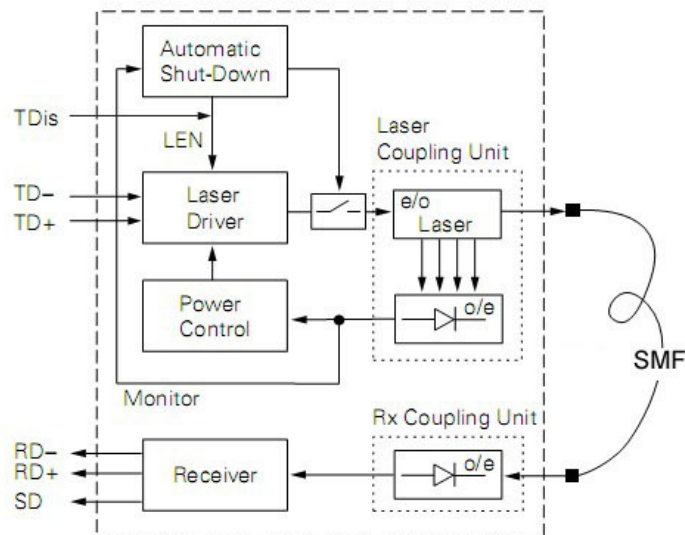
Note6: Minimum average optical power measured at BER less than 1E-12, with a 2<sup>7</sup>-1 PRBS and ER=9 dB.

Note7: Eye Pattern Mask

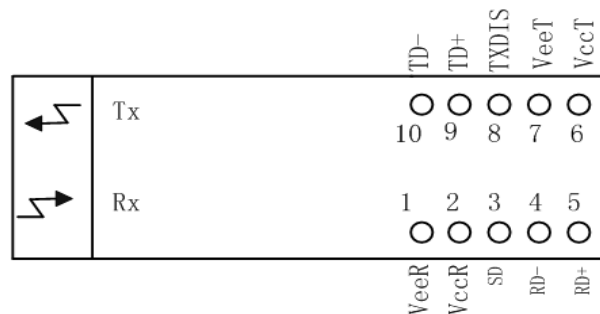
Note8: LOS Hysteresis(SD signal coincides with the Los signal inversion)



## Functional Description of Transceiver



## SFF Transceiver Electrical Pad Layout



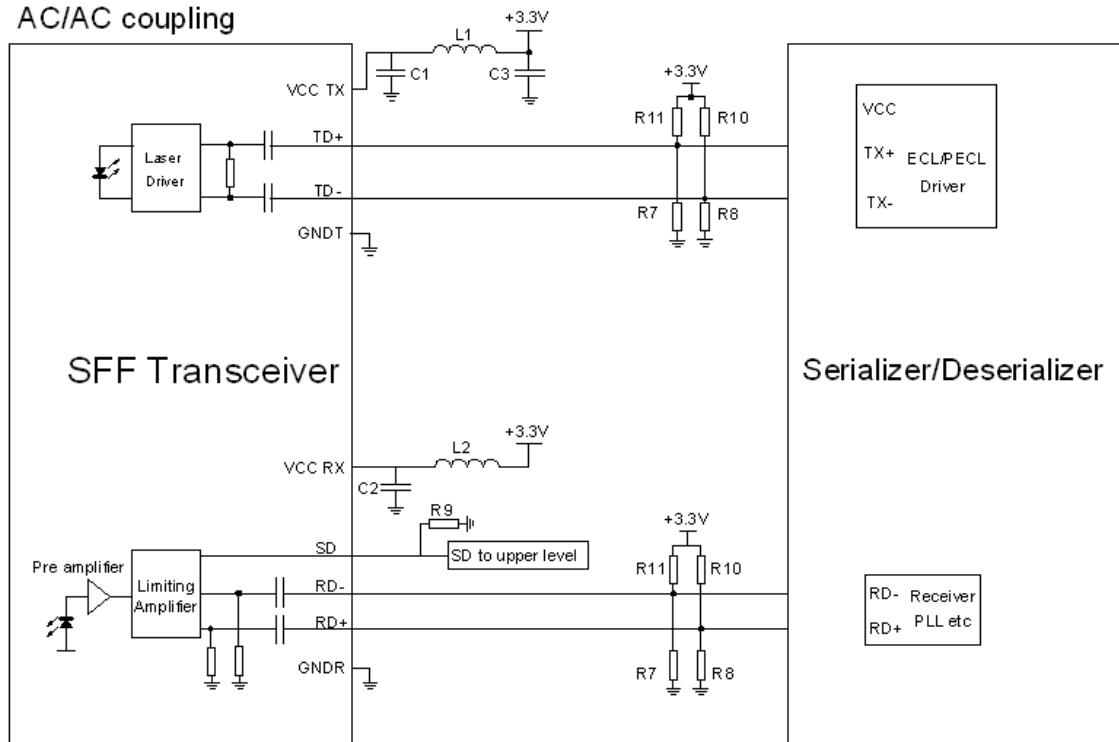
\*Case isolated from circuit ground.

## Pin Function Definitions

Pin No.	Name	Function
	MS	Mounting Studs, Case isolated from circuit ground
1	VeeR	Receiver Signal Ground
2	VccR	3.3V DC power for receiver section
3	SD	Signal Detect Output (LVPECL) "1" - "Signal valid", "0" - "Lose of signal"
4	RD-	Received Data Out Bar (LVPECL), without termination inside
5	RD+	Received Data Out (LVPECL), without termination inside
6	VccT	3.3V DC power for transmitter section
7	VeeT	Transmitter Signal Ground
8	TXDIS	Transmitter Disable (LVTTTL), "1" - Disable, "0" - Enable
9	TD+	Transmitter Data In (LVPECL), without termination inside
10	TD-	Transmitter Data In Bar (LVPECL), without termination inside

## Recommend Circuit Schematic

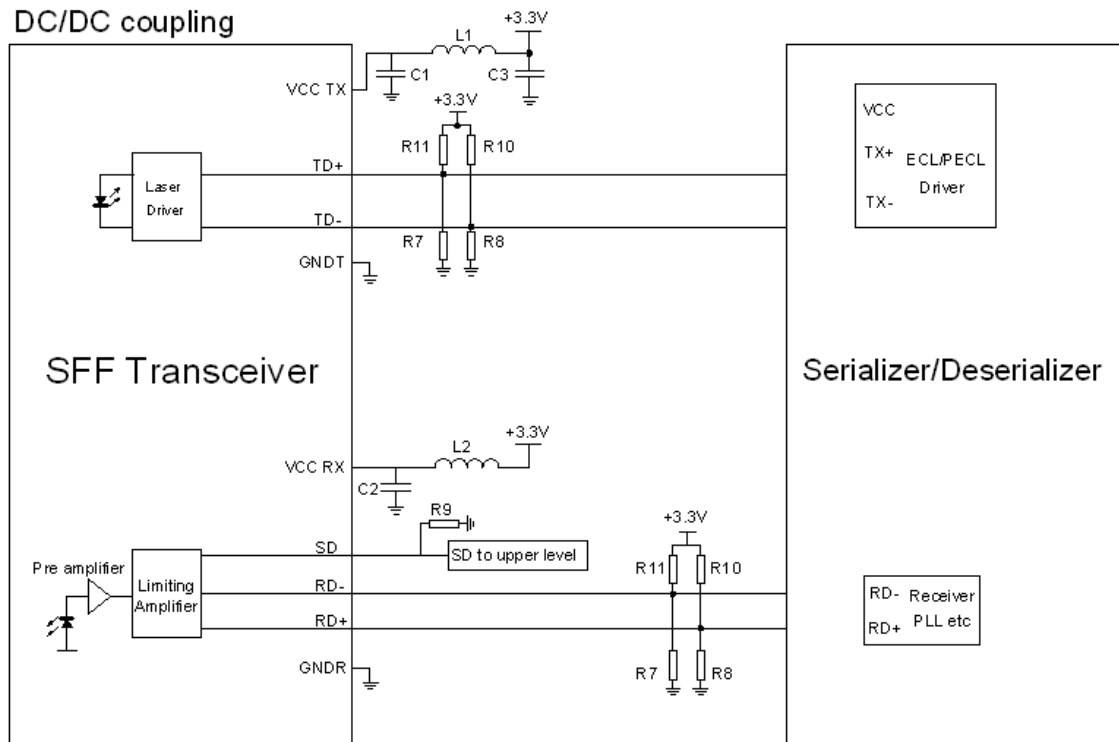
AC/AC coupling



- C1 C2 C3=4.7uF
- L1 L2=1uH
- R7 R8=82Ω(3.3V)
- (Depends on serdes chips used)
- R9=270Ω(3.3V)
- R10 R11=127Ω(3.3V)
- (Depends on serdes chips used)

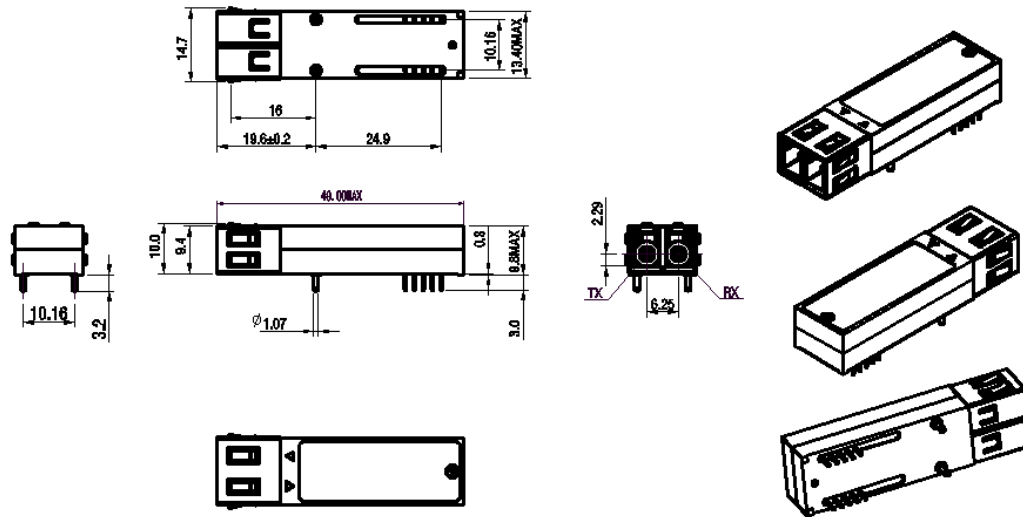


## DC/DC coupling



- C1 C2 C3=4.7uF
- L1 L2=1uH
- R7 R8=82Ω(3.3V)
- (Depends on serdes chips used)
- R9=270Ω(3.3V)
- R10 R11=127Ω(3.3V)
- (Depends on serdes chips used)

## Mechanical Specifications



## Laser Emission Data

Wavelength	1310nm
Total output power (as defined by FDA: 7mm aperture at 20cm distance)	<0.195mW
Total output power (as defined by IEC: 7mm aperture at 10cm distance)	<15.6mW
Beam divergence	12.5°

## Laser Emission



## Obtaining Document

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Or contact Eoptolink Technology Inc., Ltd. listed at the end of the documentation to get the latest document.

**Revision History**

Revision	Initiated	Reviewed	Approved	DCN	Release Date
V3.a	Cathy	Kelly		Released.	Mar 24, 2010
V3.b	Hunter	David, Kelly		Update nomenclature.	July 26, 2011
V4.a	Hunter	David, Kelly		Integrate 4 products.	Sep 29, 2011
V4.b	Hunter	Kelly		Correct rise/fall time.	Oct 28, 2011
V4.c	Jans	Kelly/Angela		Update the Pout of 10km products.	June 13, 2013

**Notice:**

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