

EOLF-GEUA-10X Series

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ONU for 1000BASE-PX10/20-U

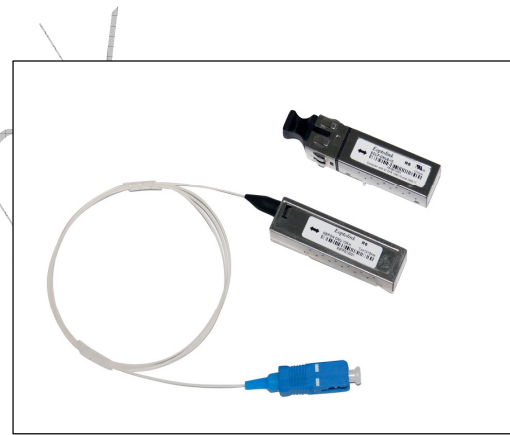
Single fiber bi-directional Transceiver

1.25Gbps upstream and 1.25Gbps downstream

RoHS6 Compliant

Features

- ◆ 2x10 SFF Package with SC Receptacle/SC Pigtail
- ◆ Single +3.3 V Power Supply
- ◆ 1.25 Gbps / 1310 nm Burst-Mode Transmitter with FP laser
- ◆ 1.25 Gbps / 1490 nm Continuous-Mode Receiver with 2R Output
- ◆ EOLF-GEUA-10X Distance up to 10km
EOLF-GEUA-20X Distance up to 20km
- ◆ LVTTTL transmitter burst-mode control
- ◆ LVTTTL receiver signal-detected indication
- ◆ Operating Case Temperature
Standard: 0°C~+70°C
- ◆ Class 1 FDA and IEC60825-1 laser safety compliant
- ▲ Compliant with IEEE 802.3ah 2004



Applications

- ◆ Gigabit Ethernet GE-PON ONU for P2MP application
- ◆ Broadband GE-PON System

Ordering information

Part No.	Input	Output	Burst-mode	Fiber	Interface	Temperature
EOLF-GEUA-101 ^{*note1}	AC	AC	LVTTTL	SMF	SC	Standard
EOLF-GEUA-10P1	AC	AC	LVTTTL	SMF	Pigtail	Standard
EOLF-GEUA-10 ^{*note1}	DC	AC	LVTTTL	SMF	SC	Standard
EOLF-GEUA-10P	DC	AC	LVTTTL	SMF	Pigtail	Standard
EOLF-GEUA-201 ^{*note1}	AC	AC	LVTTTL	SMF	SC	Standard

EOLF-GEUA-20P1	AC	AC	LVTTTL	SMF	Pigtail	Standard
EOLF-GEUA-20 ^{*note1}	DC	AC	LVTTTL	SMF	SC	Standard
EOLF-GEUA-20P	DC	AC	LVTTTL	SMF	Pigtail	Standard

Note1: Standard version

Note2: EOLF-GEUA-XP series is with pigtail, the fiber length is customized.

PON Nomenclature

EOL□-□□□-□□□□

A-BCD-EFGH

No.	Description	Option			
A	Package	F= SFF			
B	PON Type	GE=GEPON	G=GPON	B=BPON	
C	Application	U=ONU		T=OLT	
D	Form Type	5=2X5	6=2X6	A=2X10	
E	Distance	10=10km		20=20km	
F	Temp.	Blank=0~70°C		I=-40~+85°C	
G	Interface	Blank=SC		P=Pigtail/SC	
H	Tx coupling/Rx coupling/SD Logic	Blank=DC/AC/TTL	1=AC/AC/TTL	2=DC/DC/TTL	3=AC/DC/TTL

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	Compatible with standards
Electromagnetic Interference (EMI)	FCC Part 15 Class B EN55022:2006 CISPR 22B :2006 VCCI Class B	Compatible with standards Noise frequency range: 30 MHz to 6 GHz. 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	Compatible with standards. 1kHz sine-wave, 80% AM, from 80 MHz to 1 GHz. No effect on transmitter/receiver performance is detectable

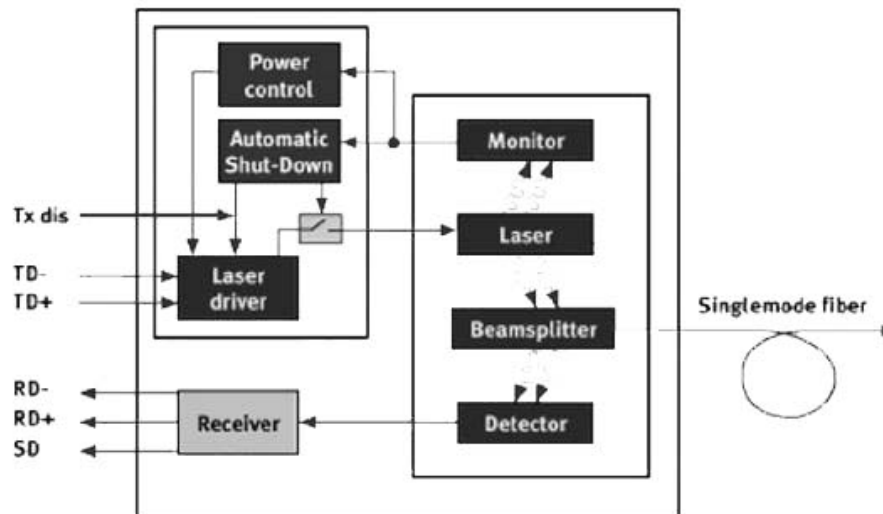
		between these limits.
Laser Eye Safety	FDA 21CFR 1040.10 and 1040.11 EN (IEC) 60825-1:2007 EN (IEC) 60825-2:2004+A1	CDRH compliant and Class I laser product. TüV Certificate No. 50135086
Component Recognition	UL and CUL EN60950-1:2006	UL file E317337 TüV Certificate No. 50135086 (CB scheme)
RoHS6	2002/95/EC 4.1&4.2 2005/747/EC 5&7&13	Compliant with standards ^{*note2}

Note2: For update of the equipments and strict control of raw materials, EOPTOLINK has the ability to supply the customized products since Jan 1th, 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, windows, isolators, and other electronic components.

Functional Diagram



The Signal Detect (SD, active high), Normal optical input levels to the receiver result in a logic "1" output, asserted.

The following version is available:

1. AC/AC Transceiver

Standard PECL inputs and outputs, Tx is AC coupling.

2. DC/AC Transceiver

Standard PECL inputs and outputs, Tx is DC coupling.

Product Description

EOLF-GEUA-XX Series is a transceiver for the optical network unit (ONU) of GE-PON with 1.25Gbps in downstream and 1.25Gbps in upstream. EOLF-GEUA-XX series is high performance module for single fiber communications by using 1310nm burst-mode transmitter and 1490 nm continuous-mode receiver.

The transmitter section uses a multiple quantum well 1310nm laser and is a class 1 laser compliant according to International Safety Standard IEC-60825-1. The receiver section uses an integrated 1490 nm detector preamplifier (IDP) mounted in an optical header and a limiting post-amplifier IC.

LVPECL interface is used for differential inputs and outputs. A LVTTTL logic interface simplifies interface to external circuitry.

Absolute Maximum Ratings

Parameter	Symbol	Min.	Max.	Unit
Storage Temperature	T _s	-40	+85	°C
Supply Voltage	V _{CC}	-0.5	4.0	V
Operating Relative Humidity	Hopr	5	95	%
Wave Soldering Conditions Temp/Time			260/10	°C/s

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

Recommended Operating Conditions

Parameter	Symbol	Min.	Typical	Max.	Unit
Operating Case Temperature	T _A	0		+70	°C
Power Supply Voltage	V _{CC}	3.15	3.3	3.45	V
Power Supply Current	I _{CC}		200	250	mA
Date Rate			1.25		Gbps

Performance Specifications - Electrical

Parameter	Symbol	Min.	Typ.	Max	Unit	Notes
Transmitter						
LVPECL Inputs(Differential)	V _{in}	300		1600	mVpp	
Input Impedance (Differential)	Z _{in}	85	100	115	ohms	R _{in} = 100 ohms
Tx_Dis	L	0		0.8	V	
	H	2		V _{CC} +0.3		
Receiver						
LVPECL Outputs (Differential)	V _{out}	370		1600	mVpp	AC coupled outputs
Output Impedance (Differential)	Z _{out}	85	100	115	ohms	
Rx_SD	SD	2		V _{CC} +0.3	V	

	Normal		0		0.8	V	
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Performance Specifications – Optical

(EOLF-GEUA-10X, FP & PIN/TIA)

Parameter	Symbol	Min.	Typical	Max.	Unit
9µmCore Diameter SMF			10		km
Data Rate			1.25		Gbps
Transmitter					
Centre Wavelength	λ_c	1276		1356	nm
Spectral Width (RMS)	$\Delta\lambda$			3.5	nm
Average Output Power ^{*(note3)}	P _{out}	-1		+4	dBm
Extinction Ratio ^{*(note4)}	ER	9			dB
Reflectance	R _t			-6	dB
Rise/Fall Time(20%~80%)	tr/tf			260	ps
Total Jitter(PRBS2 ⁷ -1)	T _J			0.35	UI
Output Optical Eye ^{*(note5)}	IEEE Std 802.3ah-2004 Compliant				
Optical Burst On Time	t _{on}			30	ns
Optical Burst Off Time	t _{off}			30	ns
Optical Output Power with TX OFF ^{*(note6)}	P _{off}			-45	dBm
Receiver					
Centre Wavelength	λ_c	1480	1490	1500	nm
Receiver Sensitivity ^{*(note6)}	P _{min}			-24	dBm
Saturation Optical Power	P _{max}	-3			dBm
Receiver Reflectance	CR			-12	dB
Optical Crosstalk				-47	dB
SD De-Assert	SDD	-32		-28	dBm
SD Assert	SDA	-23		-28	dBm
Signal Detect Hysteresis ^{*(note7)}		0.5		6	dB
Optical Isolation from external source	1260~1360nm			-38	dB
	1550~1560nm			-35	
	1640~1660nm			-20	

(EOLF-GEUA-20X, FP & PIN/TIA)

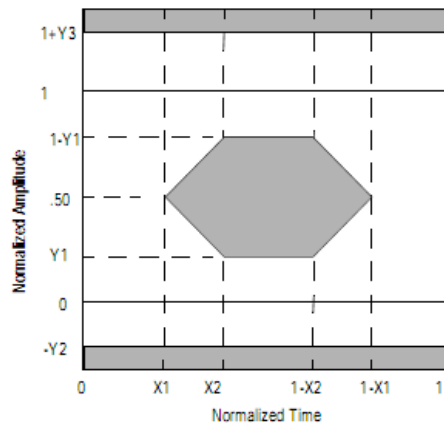
Parameter	Symbol	Min.	Typical	Max.	Unit
9µmCore Diameter SMF			20		km
Data Rate			1.25		Gbps
Transmitter					
Centre Wavelength	λ_c	1276		1356	nm
Spectral Width (RMS)	$\Delta\lambda$			2.5	nm
Average Output Power ^{*(note3)}	P _{out}	-1		+4	dBm
Extinction Ratio ^{*(note4)}	ER	9			dB

Reflectance	Rt			-6	dB
Rise/Fall Time(20%~80%)	tr/tf			260	ps
Total Jitter(PRBS ^{2⁷} -1)	T _J			0.35	UI
Output Optical Eye*(note5)	IEEE Std 802.3ah-2004 Compliant				
Optical Burst On Time	t _{on}			30	ns
Optical Burst Off Time	t _{off}			30	ns
Optical Output Power with TX OFF*(note6)	P _{off}			-45	dBm
Receiver					
Centre Wavelength	λ _c	1480	1490	1500	nm
Receiver Sensitivity*(note6)	P _{min}			-26	dBm
Saturation Optical Power	P _{max}	-3			dBm
Receiver Reflectance	CR			-12	dB
Optical Crosstalk				-47	dB
SD De-Assert	SDD	-32		-28	dBm
SD Assert	SDA	-23		-28	dBm
Signal Detect Hysteresis*(note7)		0,5		6	dB
Optical Isolation from external source	1260~1360nm			-38	dB
	1550~1560nm			-35	
	1640~1660nm			-20	

Note3: Output is coupled into a 9/125 um single-mode fiber.

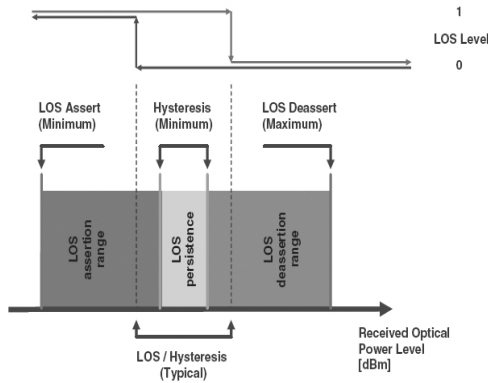
Note4: Filtered, Measured with PRBS^{2⁷}-1 test pattern @1.25Gbps.

Note5: Eye pattern mask



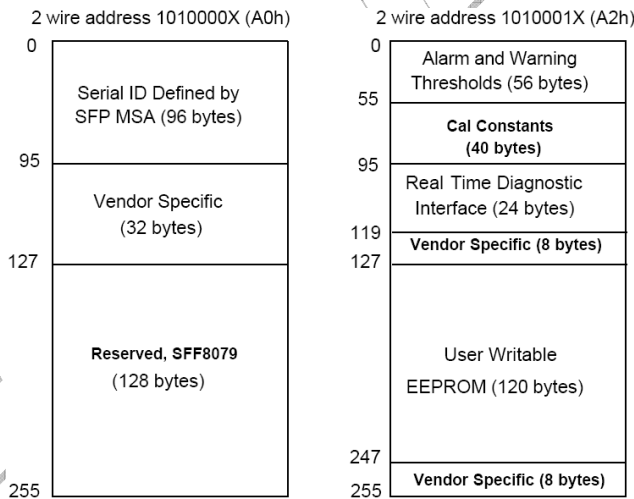
Note 6: Measured with a PRBS ^{2⁷}-1 test pattern @1.25Gbps and ER=9dB, BER is less than 1E-12.

Note7: LOS Hysteresis



Digital Diagnostic Interface

The memory map in the following describes an extension to the memory map defined in SFF-8472. The enhanced interface uses the two wire serial bus address 1010001X (A2h) to provide diagnostic information about the module's present operating conditions.



EEPROM Serial ID Memory Contents (2-Wire Address A0h)

Address	Name of Field	Hex	Description
Base ID Fields			
00	Identifier	02	SFF physical device (soldered device)
01	Ext. Identifier	04	Serial ID module supported
02	Connector	0B	Optical pigtail
03-10	Transceiver Codes	00	Undefined for GEAPON
11	Encoding	01	8B10B
12	BR, Nominal	0C	Nominal 1.25Gbps (indicate transmitter data rate)
13	Reserved	00	-
14	Length (9um)-km	0A/14	10km @9/125um fiber

15	Length (9um)-100m	64/C8	10000m @9/125um fiber
16-18	Length for MMF	00	Undefined for GEAPON
19	Reserved	00	-
20-35	Vendor Name	XX	Note
36	Channel Spacing	00	Undefined
37~39	Vendor OUI	XX	Note
40-55	Vendor P/N	XX	Note
56-59	Vendor P/N Rev.	XX	Note
60-61	Laser Wavelength	05 1E	1310nm in Hex byte
62	DWDM Wavelength Fraction	00	Undefined
63	CC_BASE	XX	Check sum of byte 0-62
Extended ID Fields			
64-65	Options	00 1A	Signal Detect is implemented
66	BR, Max.	00	Undefined
67	BR, Min.	00	Undefined
68-83	Vendor SN	XX	Vendor serial number in ASCII character, Note
84-91	Date Code	XX	Vendor date code in ASCII character, Note
92	Diagnostic Monitoring Type	68	Implemented with internal calibration and received power measurement type by Avg. power
93	Enhanced options	B0	Alarm/Warning flags monitor are implemented
94	SFF-8472 compliant	03	SFF-8472 compliant with revision 10.2
95	CC_EXT	XX	Check sum of bytes 64-94
Vendor Specific ID Fields			
96-127	Vendor Specific	00	Vendor specific EEPROM
128-256	Reserved	00	Reserved for future use

*The "XX" byte should be filled in according to practical case. For more information, please refer to the related document of SFF Multi-Source Agreement (MSA).

Digital Diagnostic Monitoring Interface (2-Wire Address A2H)

The interface uses the two wire serial bus address 1010001X (A2H) to provide diagnostic monitoring information about the module's present operating conditions as defined in SFF-8472 MSA, the monitoring range, accuracy and calibration method is as following table.

Monitoring Specification

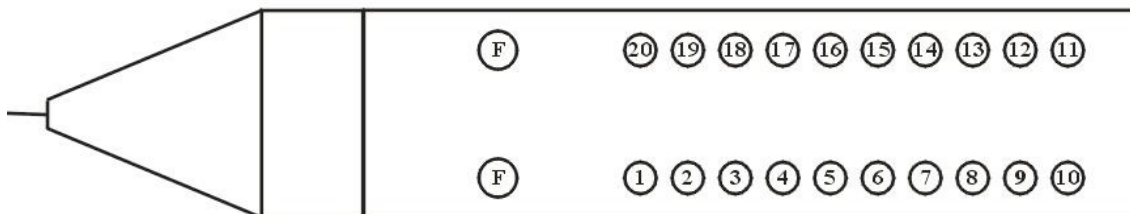
Parameter	Accuracy	Calibration	Note
Transceiver Internal Temperature ^{*(note8)}	±3°C	Internal	T _A =0~+70°C
Power Supply Internal Voltage ¹	±3%	Internal	V _{CC} =3.13~3.47 V
TX Bias Current	±10%	Internal	Specified by nominal bias

			value
RX Optical Power	±3dB	Internal	-28 to -3dBm

Note8. Internal measured to transceiver.

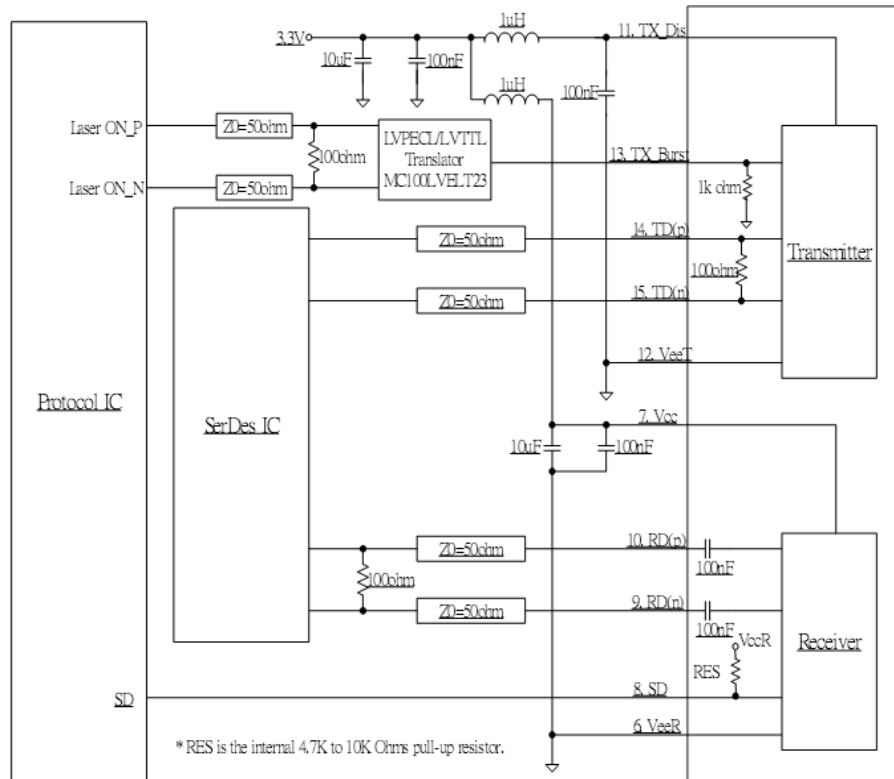
SFF2x10 Pin Function Definitions

Tx/Rx	Pin No.	I/O	Pin Name	Description
Rx	1		NC	No Function Definition
	2		VeeR	Receiver Ground
	3		VeeR	Receiver Ground
	4		NC	No Function Definition
	5		NC	No Function Definition
	6		VeeR	Receiver Ground
	7		VccR	+3.3V Receiver Power Supply
	8	O	SD	Normal Optical Input indicated by logic "High", and No Optical Input indicated by logic "Low".
	9	O	RD(n)	Inverted Receiver Data Output (AC-Coupled internally)
	10	O	RD(p)	Non-Inverted Receiver Data Output (AC-Coupled internally)
Tx	11		VccT	+3.3V Transmitter Power Supply
	12		VeeT	Transmitter Ground
	13	I	BiasCNT	LVTTL Logic "High" to Enable Burst Transmitter, and Disable Burst Transmitter by Logic "Low".
	14	I	TD(p)	Non-Inverted Transmitter Data Input (DC-Coupled)
	15	I	TD(n)	Inverted Transmitter Data Input (DC-Coupled)
	16		VeeT	Transmitter Ground (Mod-Def 0)
	17	I	SCL	I2C Serial Clock (LVTTL) (Mod-Def 1)
	18	I/O	SDA	I2C Serial Data (LVTTL) (Mod-Def 2)
	19	I	Reset	u-Processor Reset, Active Low (LVTTL)
	20		VeeR	Receiver Ground
			F	Mounting Studs/Connect this pin to Chassis ground



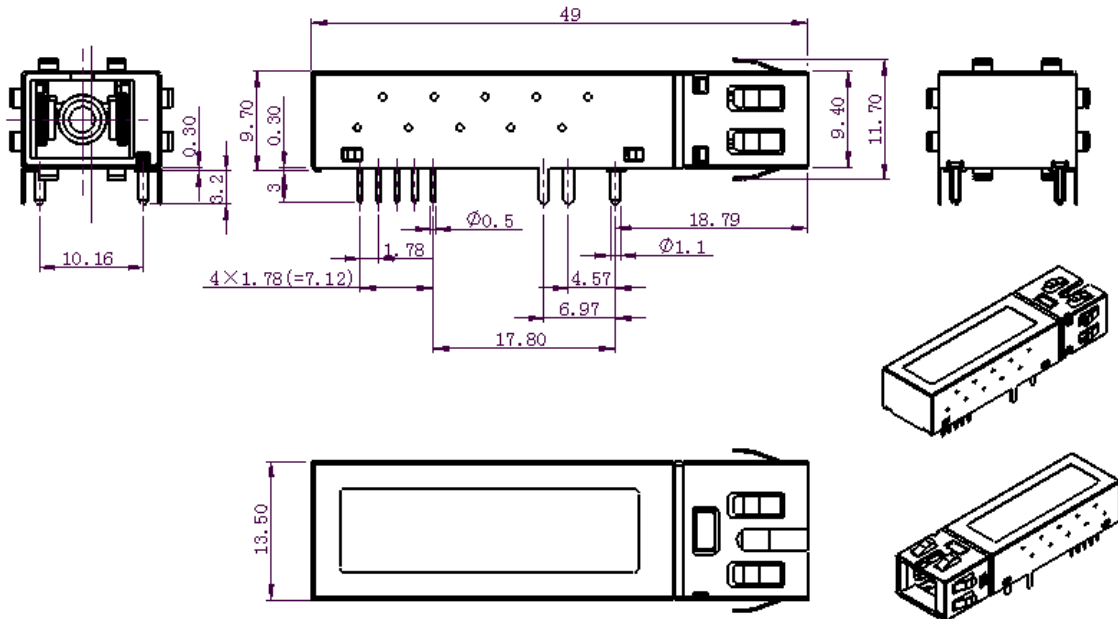
Pin arrangement

Recommend Circuit Schematic

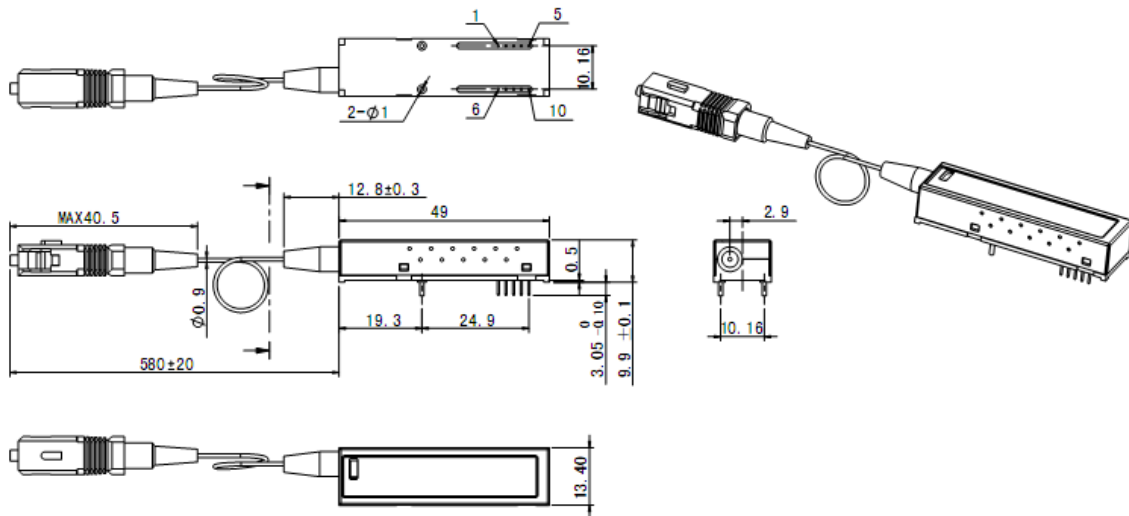


2x10

Mechanical Specifications



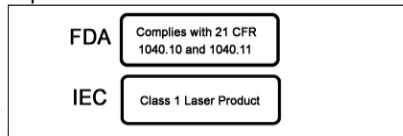
SC Receptacle



Pigtail with SC Connector

As an illustration, 2x5 SFF module is shown in the package outline figure. For 2x10 SFF modules, there is no difference on outline with 2x5 SFF module, just on the array of pins. The detail of the pins, please refer the figures in the section of Pin Description.

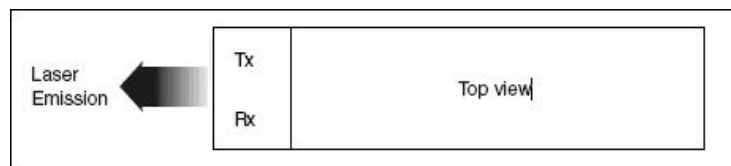
Class 1 Labels



Laser Emission Data

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

Laser Emission



Obtaining Document

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

Revision History

Revision	Initiated	Reviewed	Approved	DCN	Release Date
V5.a	Cathy	Kelly		Integrate 10km & 20km products.	Mar 12, 2009

Notice:

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