EOLP-BI1696-22LOL & EOLP-BI1696-22OLL

Tx: 1490nm/Rx: 1550nm BIDI SFP+ Transceiver for 10GbE
Tx: 1550nm/Rx: 1490nm BIDI SFP+ Transceiver for 10GbE
RoHS 6 Compliant

Features

- Operating data rate up to 11.3Gbps
- Two types:

  A: 1490nm EML Transmitter/ 1550nm APD Receiver

  B: 1550nm EML Transmitter/ 1490nm APD Receiver
- Up to 80km transmission on SMF
- Built-in dual CDR
- Single 3.3V Power supply and TTL Logic Interface
- LC Connector Interface
- Hot Pluggable
- Power Dissipation < 2W
- Operating Case Temperature

  Standard:0℃~+70℃
- Compliant with SFP+ MSA Specification SFF-8431
- Compliant with SFF-8472
- Safety Certification: TUV/UL/FDA*Note1

Applications

- 10GBASE-ZR at 10.3125Gbps
- 10GBASE-ZW at 9.953Gbps
- CPRI rates 10.138Gb/s, 9.830 Gb/s
- Other Optical Links

Ordering information

Part No.	Data Rate	Laser	Temp.	Power Budget	Optical Interface	CDR	DDMI
EOLP-BI1696-22 LOL* Note2	Typical10.3125 Gbps	1490nm EML	0~70℃	22dB	LC	YES	YES
EOLP-BI1696-22 OLL* Note2	Typical 10.3125Gbps	1550nm EML	0~70℃	22dB	LC	YES	YES

Note1: For the latest certification information, please check with Eoptolink.

Note2: Standard version.

*The product image only for reference purpose.

Product Description

The EOLP-BI1696-22XXL series single mode transceiver is small form factor pluggable module for duplex optical data communications such as 10GBASE-LR/LW defined by IEEE 802.3ae. It is with the SFP+ 20-pin connector to allow hot plug capability.

The EOLP-BI1696-22LOL module is designed for single mode fiber and operates at a nominal wavelength of 1490nm; EOLP-BI1696-22OLL module is designed for single mode fiber and operates at a nominal wavelength of 1550nm. The transmitter section uses a multiple quantum well DFB, which is class 1 laser compliant according to 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.

Absolute Maximum Ratings* Note3

Parameter	Symbol	Min.	Max.	Unit
Storage Temperature	T_S	-40	+85	°C
Supply Voltage	V_{CC}	-0.5	3.6	V
Operating Relative Humidity	RH	5	95	%

*Note3: Exceeding any one of these values may destroy the device permanently.

Recommended Operating Conditions

Parameter	Symbol	Min.	Typical	Max.	Unit
Power Supply Voltage	V_{CC}	3.15	3.3	3.45	V
Power Supply Current	I_{CC}			606	mA
Operating Case Temperature	T_c		0	70	°C

Performance Specifications - Electrical

Parameter	Symbol	Min.	Typ.	Max	Unit	Notes
Transmitter						
CML Inputs(Differential)	Vin	150		1200	mVpp	AC coupled inputs
Input Impedance (Differential)	Zin	85	100	115	ohms	Rin > 100 kohms @ DC
Tx_DISABLE Input Voltage - High		2		Vcc+0.3	V	
Tx_DISABLE Input Voltage - Low		0		0.8	V	
Tx_FAULT Output Voltage - High		2		Vcc+0.3	V	Io = 400μA; Host Vcc
Tx_FAULT Output Voltage - Low		0		0.5	V	Io = -4.0mA

Receiver						
CML Outputs (Differential)	Vout	120		800	mVpp	AC coupled outputs
Output Impedance (Differential)	Zout	85	100	115	ohms	
Rx_LOS Output Voltage - High		2		Vcc+0.3	V	Io = 400μA; Host Vcc
Rx_LOS Output Voltage - Low		0		0.8	V	Io = -4.0mA
MOD_DEF (2:0)	VoH	2.5			V	With Serial ID
	VoL	0		0.5	V	

Optical and Electrical Characteristics

(EOLP-BI1696-22LOL, 1490nm EML & APD/TIA)

Parameter	Symbol	Min.	Typical	Max.	Unit
Data Rate			10.3125	11.3	Gbps
Transmitter					
Center Wavelength	λ_C	1480	1490	1500	nm
Spectral Width (-20dB)	Δλ			1	nm
Side Mode Suppression Ratio	SMSR	30			dB
Average Output Power@10.3125Gbps *note4	$P_{out, AVG}$	-1		4	dBm
Extinction Ratio@10.3125Gbps	ER	7.5			dB
Average Power of OFF Transmitter				-30	dBm
Relative Intensity Noise	RIN			-128	dB/Hz
Eye Mask	Compliant with IEEE 802.3ae *note5				
Receiver					
Center Wavelength	λ_C	1540		1560	nm
Sensitivity@10.3125Gbps *note6	P_{min}			-23	dBm
Sensitivity(SM 80km)@10.3125Gbps *note6	P_{min}			-20	dBm
Receiver Overload	P_{MAX}	-6			dBm
LOS De-Assert	LOS_D			-24	dBm
LOS Assert	LOS_A	-38			dBm
LOS -Hysteresis	PHys	0.5	-	8	dB

(EOLP-BI1696-22OLL, 1550nm EML & APD/TIA)

Parameter	Symbol	Min.	Typical	Max.	Unit
Data Rate			10.3125	11.3	Gbps
Transmitter					
Centre Wavelength	λ_C	1540	1550	1560	nm
Spectral Width (-20dB)	Δλ			1	nm
Side Mode Suppression Ratio	SMSR	30			dB
Average Output Power@10.3125Gbps *note4	$P_{out, AVG}$	-1		4	dBm

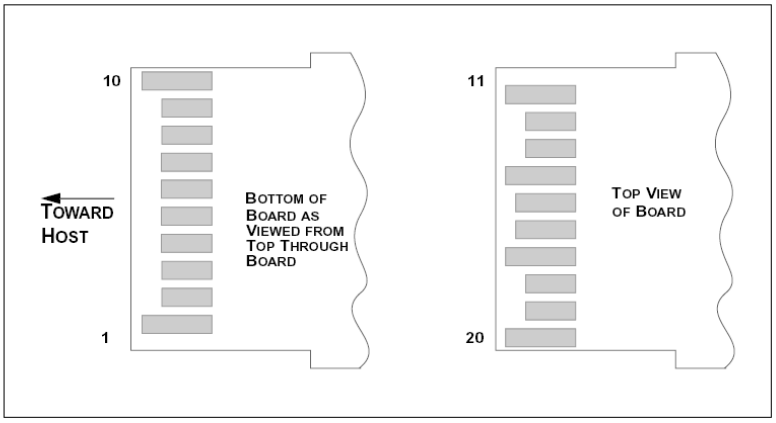
Extinction Ratio@10.3125Gbps	ER	7.5			dB
Average Power of OFF Transmitter				-30	dBm
Relative Intensity Noise	RIN			-128	dB/Hz
Eye Mask	Compliant with IEEE 802.3ae*note5				
Receiver					
Centre Wavelength	λ_C	1480		1500	nm
Sensitivity@10.3125Gbps *note6	Pmin			-23	dBm
Sensitivity(SM 80km)@10.3125Gbps*note6	Pmin			-20	dbm
Receiver Overload	P_{MAX}	-6			dBm
LOS De-Assert	LOS_D			-24	dBm
LOS Assert	LOS_A	-38			dBm
LOS -Hysteresis	PHys	0.5	-	8	dB

*Note4: Output is coupled into a 9/125um SMF.

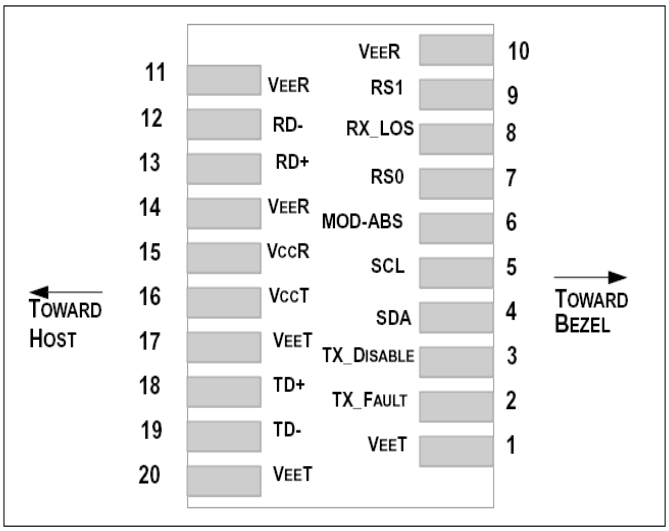
*Note5: Measured with RPBS 2^31-1 test pattern @10.3125Gbs

*Note6: Measured with BER less than 1E-12 and PRBS 2^{31}-1 at 10.3125Gbps.

SFP+ Transceiver Electrical Pad Layout



Pin Function Definitions



Pin Num.	Name	FUNCTION	Plug Seq.	Notes
1	VeeT	Transmitter Ground	1	Note 5
2	TX Fault	Transmitter Fault Indication	3	Note 1
3	TX Disable	Transmitter Disable	3	Note 2, Module disables on high or open
4	SDA	Module Definition 2	3	2-wire Serial Interface Data Line.
5	SCL	Module Definition 1	3	2-wire Serial Interface Clock.
6	MOD_ABS	Module Definition 0	3	Note 3
7	RS0	RX Rate Select (LVTTL).	3	No Function Implement.
8	RX LOS	Loss of Signal	3	Note 4
9	RS1	TX Rate Select (LVTTL).	1	No Function Implement.
10	VeeR	Receiver Ground	1	Note 5
11	VeeR	Receiver Ground	1	Note 5
12	RD-	Inv. Received Data Out	3	Note 6
13	RD+	Received Data Out	3	Note 6
14	VeeR	Receiver Ground	1	Note 5
15	VccR	Receiver Power	2	3.3 ± 5%, Note 7
16	VccT	Transmitter Power	2	3.3 ± 5%, Note 7
17	VeeT	Transmitter Ground	1	Note 5
18	TD+	Transmit Data In	3	Note 8
19	TD-	Inv. Transmit Data In	3	Note 8
20	VeeT	Transmitter Ground	1	Note 5

Notes:

1) TX Fault is an open collector/drain output, which should be pulled up with a 4.7K – 10KΩ resistor

on the host board. Pull up voltage between 2.0V and VccT/R+0.3V. When high, output indicates a laser fault of some kind. Low indicates normal operation. In the low state, the output will be pulled to < 0.8V.

2) TX disable is an input that is used to shut down the transmitter optical output. It is pulled up within the module with a 4.7K – 10 KΩ resistor. Its states are:
Low (0 – 0.8V): Transmitter on
(>0.8, < 2.0V): Undefined
High (2.0 – 3.465V): Transmitter Disabled
Open: Transmitter Disabled

3) Module Absent, connected to VeeT or VeeR in the module.

4) RX LOS (Loss of Signal) is an open collector/drain output, which should be pulled up with a 4.7K – 10KΩ resistor. Pull up voltage between 2.0V and VccT/R+0.3V. When high, this output indicates the received optical power is below the worst-case receiver sensitivity (as defined by the standard in use). Low indicates normal operation. In the low state, the output will be pulled to < 0.8V.

5) The module signal ground contacts, VeeR and VeeT, should be isolated from the module case.

6) RD-/+: These are the differential receiver outputs. They are AC coupled 100Ω differential lines which should be terminated with 100Ω (differential) at the user SERDES. The AC coupling is done inside the module and is thus not required on the host board. The voltage swing on these lines will be between 120 and 800 mV differential (60 –400 mV single ended) when properly terminated.

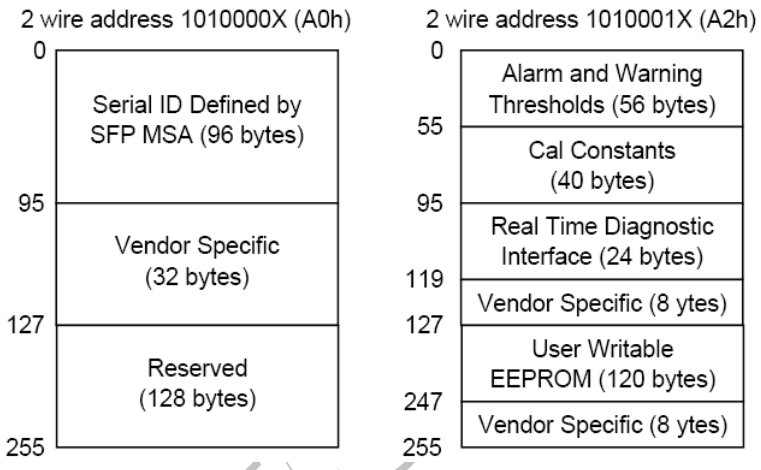
7) VccR and VccT are the receiver and transmitter power supplies. They are defined as 3.3V ±5% at the SFP+ connector pin. Maximum supply current is 606mA. Recommended host board power supply filtering is shown below. Inductors with DC resistance of less than 1 ohm should be used in order to maintain the required voltage at the SFP+ input pin with 3.3V supply voltage. When the recommended supply-filtering network is used, hot plugging of the SFP+ transceiver module will result in an inrush current of no more than 30mA greater than the steady state value. VccR and VccT may be internally connected within the SFP+ transceiver module.

8) TD-/+: These are the differential transmitter inputs. They are AC-coupled, differential lines with 100Ω differential termination inside the module. The AC coupling is done inside the module and is thus not required on the host board. The inputs will accept differential swings of 150 – 1200 mV (75 – 600mV single-ended).

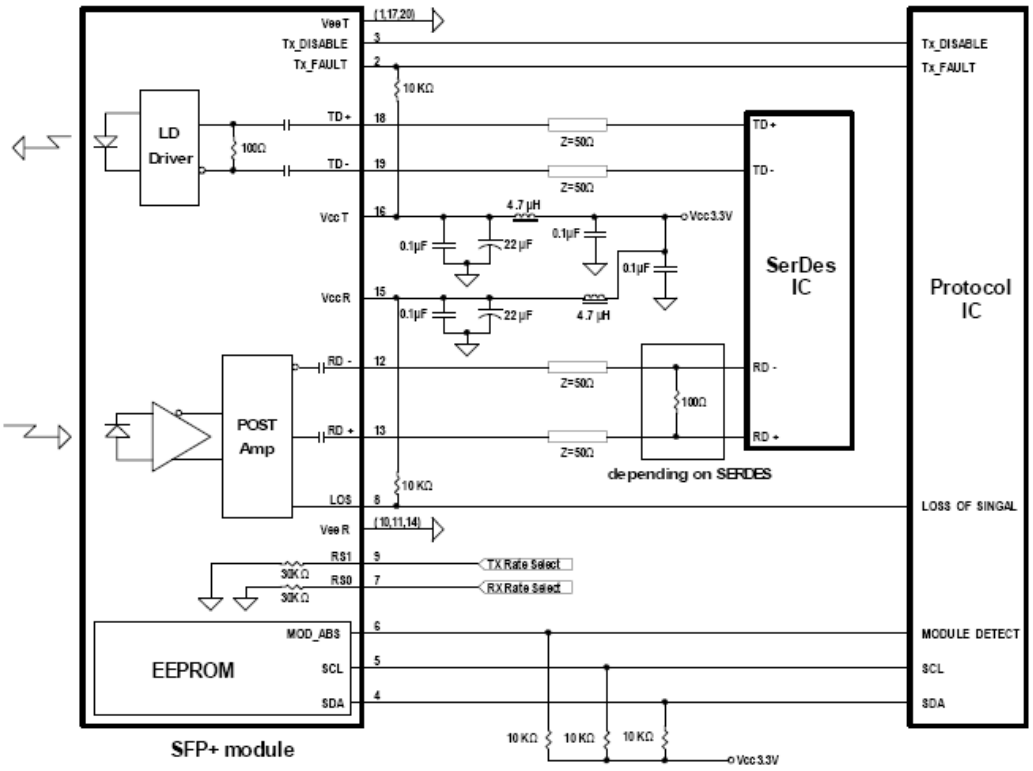
EEPROM

The serial interface uses the 2-wire serial CMOS EEPROM protocol. When the serial protocol is activated, the host generates the serial clock signal (SCL). The positive edge clocks data into those segments of the EEPROM that are not writing protected within the SFP+ transceiver. The negative edge clocks data from the SFP+ transceiver. The serial data signal (SDA) is bi-directional for serial data transfer. The host uses SDA in conjunction with SCL to mark the start and end of serial protocol activation. The memories are organized as a series of 8-bit data words that can be addressed individually or sequentially.

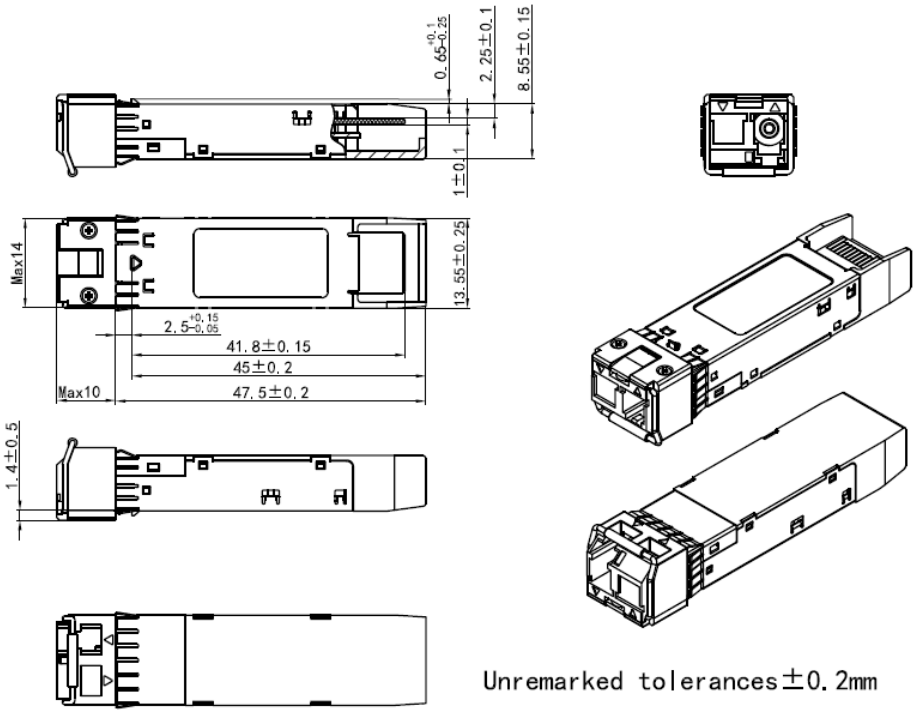
The Module provides diagnostic information about the present operating conditions. The transceiver generates this diagnostic data by digitization of internal analog signals. Calibration and alarm/warning threshold data is written during device manufacture. Received power monitoring, transmitted power monitoring, bias current monitoring, supply voltage monitoring and temperature monitoring all are implemented. If the module is defined as external calibrated, the diagnostic data are raw A/D values and must be converted to real world units using calibration constants stored in EEPROM locations 56 – 95 at wire serial bus address A2h. The digital diagnostic memory map specific data field define as following .For detail EEPROM information, please refer to the related document of SFF 8472 Rev 12.2.



Recommend Circuit Schematic



Mechanical Specifications



*This 2D drawing only for reference, please check with Eoptolink before ordering.

Eye Safety

This single-mode transceiver is a Class 1 laser product. It complies with IEC-60825 and FDA 21 CFR 1040.10 and 1040.11. The transceiver must be operated within the specified temperature and voltage limits. The optical ports of the module shall be terminated with an optical connector or with a dust plug.

Obtaining Document

You can visit our website:
http://www.eoptolink.com
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
V1.a	Roty	Marvin/Nico/ Kelly/Fing/John/Eason		Preliminary	May 09, 2019

Notice:

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