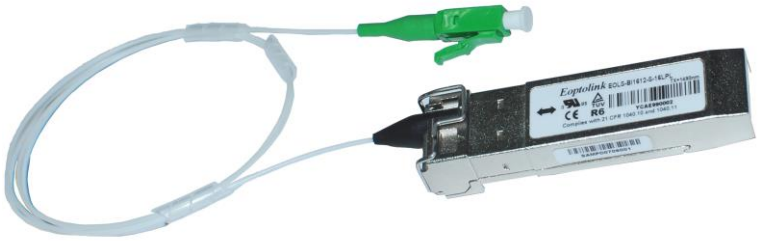
EOLP-BI1696-S-9XPL

Single-Mode 10Gbps Pigtail with LC/APC Connector
Bi-directional SFP+ Transceiver with same wavelength of TX/RX
RoHS6 Compliant



Features

- Supports 9.95Gb/s to 11.1Gb/s bit rates
- Hot-Pluggable SFP+ footprint
- 4-Wavelength CWDM DFB Transmitter from 1270nm to 1330nm, with step 20nm
- 9dB Power Budget at Least
- LC/APC pigtail connector
- Power Dissipation < 1.2W
- Case operation temperature range:
  Standard: 0°C to 70°C
- Compliant with SFP+ MSA Specification SFF-8431
- Build-in digital diagnostic functions
- Compliant with SFF-8472 MSA

Applications

- 10GBASE-LR/LW 10G Ethernet
- 10GBASE-LR at 10.31Gbps
- 10GBASE-LW at 9.95Gbps
- Other optical links

Ordering information

Part No.	Data Rate	Laser	Fiber	Power budget	Interface	DDMI
EOLP-BI1696-S-9XPL*Note1	10G	CWDM DFB	SMF	⩾9dB	LC/APC/pigtail	YES

Note1: X refers to CWDM Wavelength range 1270nm to 1330nm, X=A~D, denotes 1270nm to 1330nm.

*The product image only for reference purpose.

CWDM*[Note2] Wavelength

Band	Nomenclature	Wavelength(nm)		
		Min.	Typ.	Max.
O-band Original	A	1264	1270	1277.5
	B	1284	1290	1297.5
	C	1304	1310	1317.5
	D	1324	1330	1337.5

Note2: 4 Wavelengths from 1270nm to 1330nm, each step 20nm. Please contact EOPTOLINK to confirm whether the wavelength is available.

Regulatory Compliance*[Note2]

Product Certificate	Certificate Number	Applicable Standard
TUV	R50135086	EN 60950-1:2006+A11+A1+A12+A2
		EN 60825-1:2014
		EN 60825-2:2004+A1+A2
UL	E317337	UL 60950-1
		CSA C22.2 No. 60950-1-07
EMC CE	AE 50285865 0001	EN 55022:2010
		EN 55024:2010
FCC	WTF14F0514417E	47 CFR PART 15 OCT., 2013
FDA	/	CDRH 1040.10
ROHS	/	2011/65/EU

Note2:The above certificate number updated to June 2014, because some certificate will be updated every year, such as FDA and ROHS. For the latest certification information, please check with Eoptolink.

Product Description

The EOLP-BI1696-S-9XPL series optical transceiver is designed for fiber communications application such as 10G Ethernet (10GBASE-LR), which fully compliant with the specification of SFP+ MSA SFF-8431.

This module is designed for single mode fiber and operates at a nominal wavelength of CWDM wavelength. There are four center wavelengths available from 1270nm to 1330nm, with each step 20nm. A guaranteed minimum optical link budget of 9 dB is offered.

The module is with the SFP+ connector to allow hot plug capability. Single 3.3V power supply is needed. The optical output can be disabled by LVTTL logic high-level input of TX_DIS. Loss of signal (RX_LOS) output is provided to indicate the loss of an input optical signal of receiver.

This module provides digital diagnostic functions via a 2-wire serial interface as defined by the SFF-8472 specification.

Absolute Maximum Ratings

Parameter	Symbol	Min	Typical	Max	Unit	Note
Maximum Supply Voltage	Vcc	-0.5		4.0	V	
Storage Temperature	T_S	-40		85	°C	

Recommend Operating Condition

Parameter	Symbol	Min	Typical	Max	Units	Note
Case Operating Temperature	T_C	0		70	°C	
Supply Voltage	Vcc	3.13	3.3	3.45	V	
Supply Current	Icc			350	mA	
Data Rate		9.95		11.1	Gbps	

Electrical Characteristics

Parameter	Symbol	Min.	Typ.	Max	Unit
Transmitter					
CML Inputs(Differential)*Note3	Vin	150		1200	mVpp
Input Impedance (Differential)	Zin	85	100	115	ohm
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
Tx_FAULT Output Voltage -- Low		0		0.8	V
Receiver					
CML Outputs (Differential) *Note3	Vout	350		700	mVpp
Output Impedance (Differential)	Zout	85	100	115	ohms
Rx_LOS Output Voltage - High		2		Vcc+0.3	V
Rx_LOS Output Voltage - Low		0		0.8	V
MOD_DEF (0:2) *Note4	VoH	2.5			V
	VoL	0		0.5	V

Note3: After internal AC coupling.

Note4: Reference the SFF-8472 MSA.

Optical Characteristics (CWDM DFB and PIN-TIA with 9dB Power Budget)

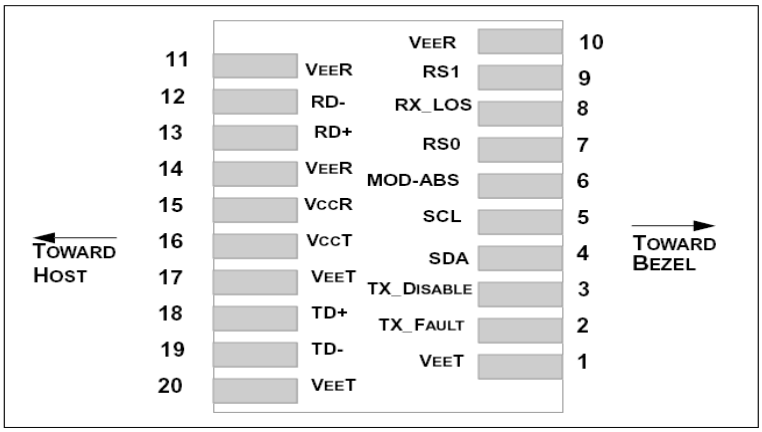
Parameter	Symbol	Min	Typical	Max	Unit
Transmitter					
Output Opt. Pwr: 9/125 SMF*Note2*Note5	Pout	-3		2	dBm
Optical Extinction Ratio	ER	3.5			dB
Optical Wavelength*Note6	λ	λc–6	λc	λc+7.5	nm
-20dB Spectrum Width	Δλ			1	nm
Side Mode Suppression Ratio	SMSR	30			dB
Average Launch Power of OFF Transmitter	P_{OFF}			-30	dBm
TX Jitter Generation (Peak-to-Peak)	TXj			0.1	UI
TX Jitter Generation (RMS)	TXj RMS			0.01	UI
Receiver					
Receiver Sensitivity @ 10.7Gb/s*Note7	Pmin			-12	dBm
Maximum Input Power	Pmax	+0.5			dBm
Optical Center Wavelength	λ	1260		1620	nm
Receiver Reflectance	Rrf			-27	dB
LOS De-Assert	LOS_D			-14	dBm
LOS Assert	LOS_A	-26			dBm
LOS Hysteresis		1			dB

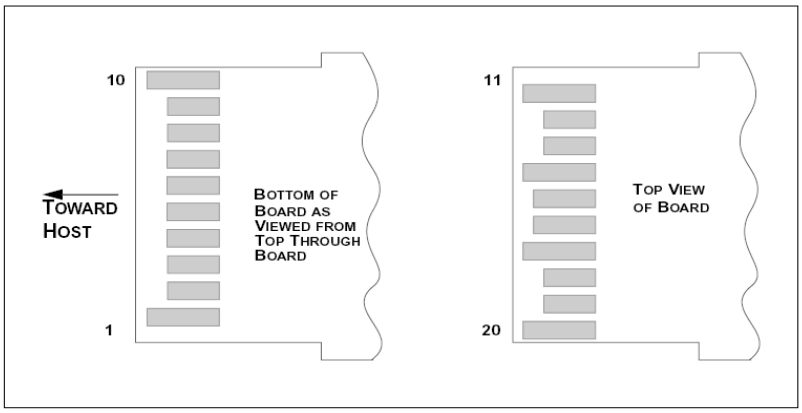
Note5: Output power is coupled into a 9/125μm SMF.

Note6: ITU-T G.694.2 CWDM wavelength from 1270nm to 1330nm, each step 20nm.

Note7: Average received power; BER less than 1E-12 and PRBS 2^{31}-1 test pattern.

SFP+ Transceiver Electrical Pad Layout





Pin Function Definitions

Pin Num.	Name	Function	Plug Seq.	Notes
1	VeeT	Transmitter Ground	1	5)
2	TX Fault	Transmitter Fault Indication	3	1)
3	TX Disable	Transmitter Disable	3	2), Module disables on high or open
4	SDA	Module Definition 2	3	Data line for Serial ID.
5	SCL	Module Definition 1	3	Clock line for Serial ID.
6	MOD-ABS	Module Definition 0	3	3)
7	RS0	RX Rate Select (LVTTL).	3	This pin has an internal 30k pull down to ground. A signal on this pin will not affect module performance.
8	LOS	Loss of Signal	3	4)
9	RS1	TX Rate Select (LVTTL).	1	This pin has an internal 30k pull down to ground. A signal on this pin will not affect module performance.
10	VeeR	Receiver Ground	1	5)
11	VeeR	Receiver Ground	1	5)
12	RD-	Inv. Received Data Out	3	6)
13	RD+	Received Data Out	3	6)
14	VeeR	Receiver Ground	1	5)
15	VccR	Receiver Power	2	3.3V ± 5%, 7)
16	VccT	Transmitter Power	2	3.3V ± 5%, 7)
17	VeeT	Transmitter Ground	1	5)
18	TD+	Transmit Data In	3	8)
19	TD-	Inv. Transmit Data In	3	8)
20	VeeT	Transmitter Ground	1	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 K Ω 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) 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) VeeR and VeeT may be internally connected within the SFP+ module.

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 370 and 700 mV differential (185 –350 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 300mA. 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.

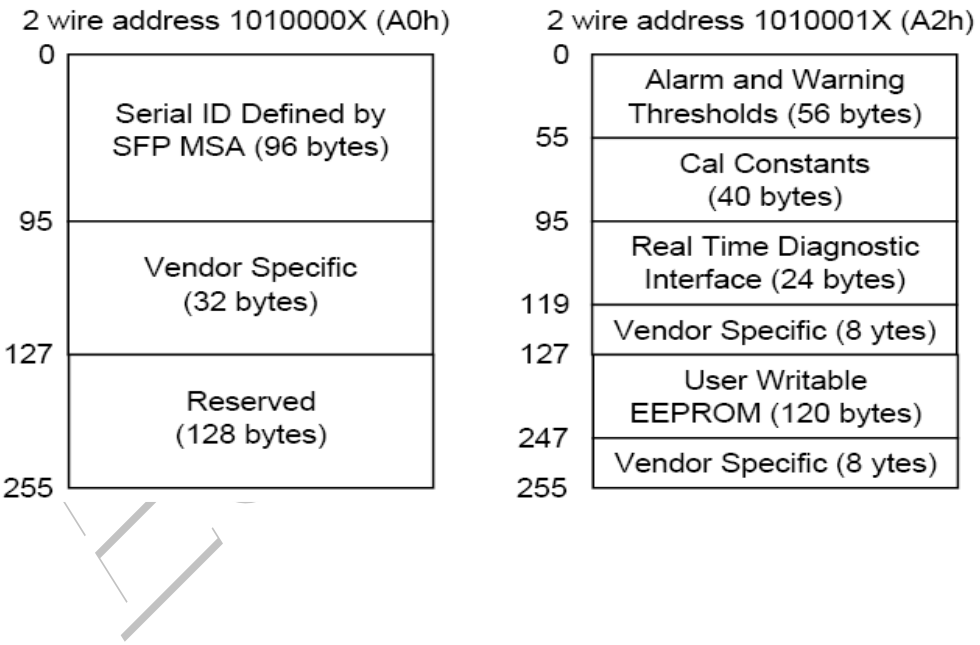
8) TD-/+: These are the differential transmitter inputs. They are AC-coupled, differential lines with 100Ω differential termination inside the module. The AC coupling is done inside the module and is thus not required on the host board. The inputs will accept differential swings of 150 – 1200 mV (75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

EEPROM

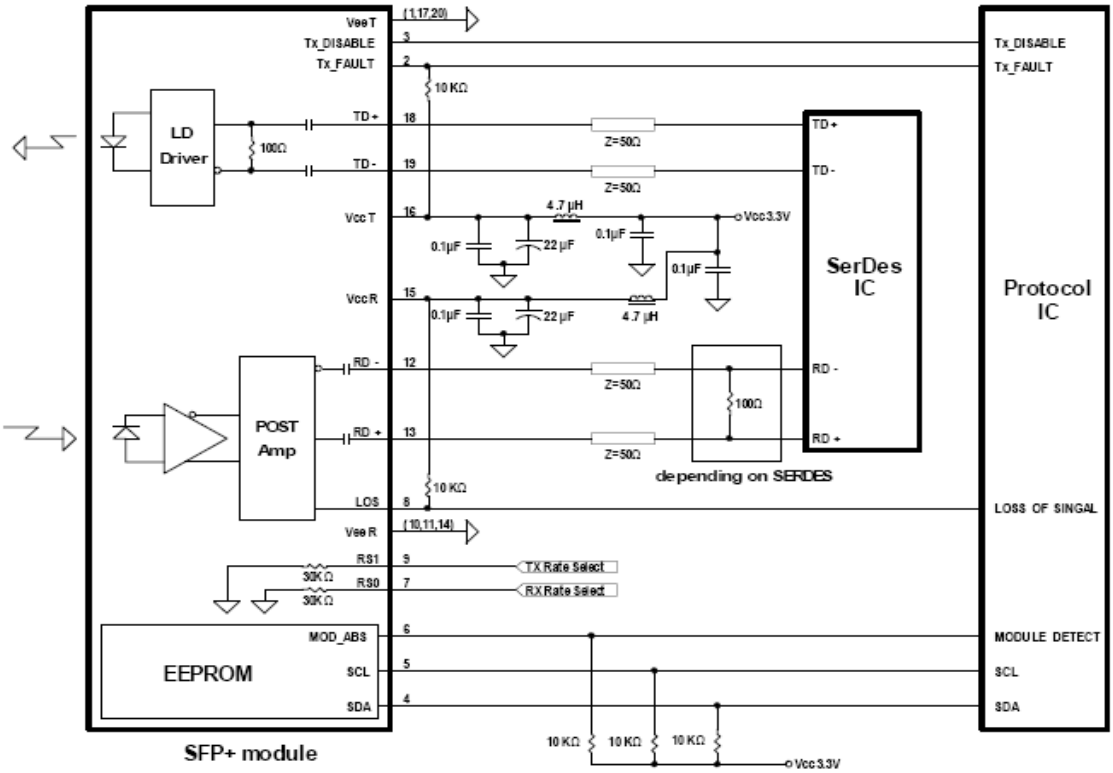
The serial interface uses the 2-wire serial CMOS EEPROM protocol defined for the ATMEL AT24C02/04 family of components. When the serial protocol is activated, the host generates the serial clock signal (SCL). The positive edge clocks data into those segments of the EEPROM that

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.

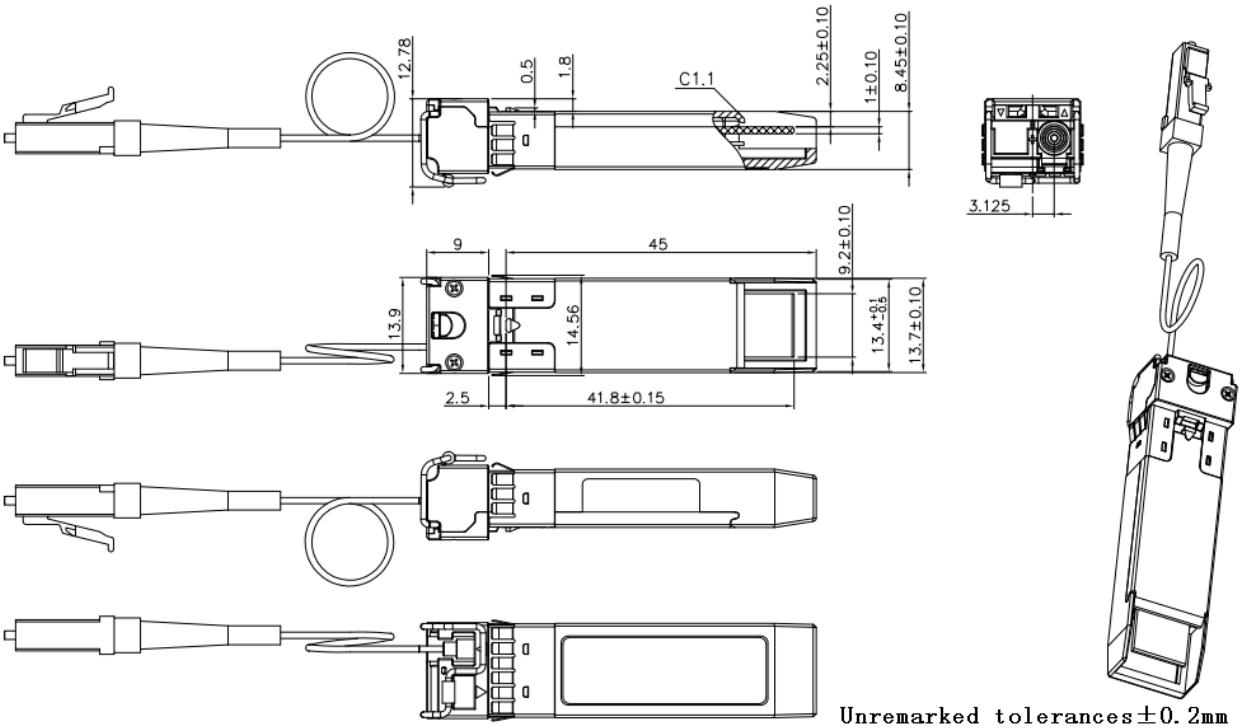
The Module provides diagnostic information about the present operating conditions. The transceiver generates this diagnostic data by digitization of internal analog signals. Calibration and alarm/warning threshold data is written during device manufacture. Received power monitoring, transmitted power 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 10.3.



Recommend Circuit Schematic



Mechanical Specifications



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Revision History

Revision	Initiate	Review	Approve	DCN	Release Date
V1.a	Alex/Abby	Alex/Kelly		New Released	Nov 21, 2013
V1.b	Angela	Fing/Kelly/ Vina		Delete the TDP , update the regulatory compliance and tolerances of 2D drawing .	April 14,2015
V1.c	Elaine	Kelly		Update the regulatory compliance and the contact.	Mar 28, 2018

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