

EOLP-1396-40

1310nm SFP+ single-Mode Transceiver, With Diagnostic Monitoring
10G BASE-EW/ER
Duplex SFP+ Transceiver, RoHS 6 Compliant

Features

- ◆ Operating data rate up to 11.3Gbps
- ◆ 1310nm DFB-LD Transmitter
- ◆ Distance up to 40km
- ◆ Single 3.3V Power supply and TTL Logic Interface
- ◆ Duplex LC Connector Interface
- ◆ Hot Pluggable
- ◆ Power Dissipation < 1.5W
- ◆ Compliant with MSA SFP+ Specification SFF-8431
- ◆ Compliant with IEEE 802.3ae 10GBASE-ER/EW
- ◆ Operating Case Temperature
 Standard: 0°C~+70°C
 Industrial: -40°C~+85°C



Applications

- ◆ 10GBASE-ER at 10.31Gbps
- ◆ 10GBASE-EW at 9.95Gbps
- ◆ OBSAI rates 6.144 Gb/s, 3.072 Gb/s, 1.536 Gb/s, 0.768Gb/s
- ◆ CPRI rates 9.830 Gb/s,7.373Gb/s, 6.144 Gb/s, 4.915 Gb/s, 2.458 Gb/s, 1.229 Gb/s, 0.614Gb/s
- ◆ Other optical links

Ordering information

Part No.	Data Rate	Laser	Fiber Type	Distance	Optical Interface	Temp.	DDMI
EOLP-1396-40*	0.614Gbps to 11.3Gbps	1310nm DFB	SMF	40km	LC	Standard	YES
EOLP-1396-40-I	0.614Gbps to 11.3Gbps	1310nm DFB	SMF	40km	LC	Industrial	YES

Regulatory Compliance

Product Certificate	Certificate Number	Applicable Standard
TUV	R50135086	EN 60950-1:2006+A11+A1+A12
		EN 60825-1:2007
		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
CB	JPTUV-049251	IEC 60825-1
		IEC 60950-1
FCC	WTF14F0514437E	47 CFR PART 15 OCT., 2013
FDA	1331340-000	CDRH 1040.10
ROHS	RHS01G006464	2011/65/EU

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

Product Description

The EOLP-1396-40 series single mode transceiver is small form factor pluggable module for serial optical data communications such as IEEE 802.3ae 10GBASE-ER/EW. It is with the SFP+ 20-pin connector to allow hot plug capability.

This module is designed for single mode fiber and operates at a nominal wavelength of 1310 nm. The transmitter section uses a 1310nm multiple quantum well DFB laser and is a 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

Parameter	Symbol	Min.	Max.	Unit
Storage Temperature	T_s	-40	+85	°C
Supply Voltage	V_{CC}	-0.5	3.6	V
Input Voltage	V_{in}	-0.5	V_{CC}	V
Output Current	I_o	-	50	mA

Recommended Operating Conditions

Parameter	Symbol	Min.	Typical	Max.	Unit
Operating Case Temperature	T_c	EOLP-1396-40	0	+70	°C
		EOLP-1396-40-I	-40	+85	
Power Supply Voltage	V_{CC}	3.15	3.3	3.45	V

Power Supply Current	I_{CC}			430	mA
Surge Current	I_{Surge}			+30	mA
Baud Rate		0.614		11.3	Gbps

Performance Specifications – Electrical

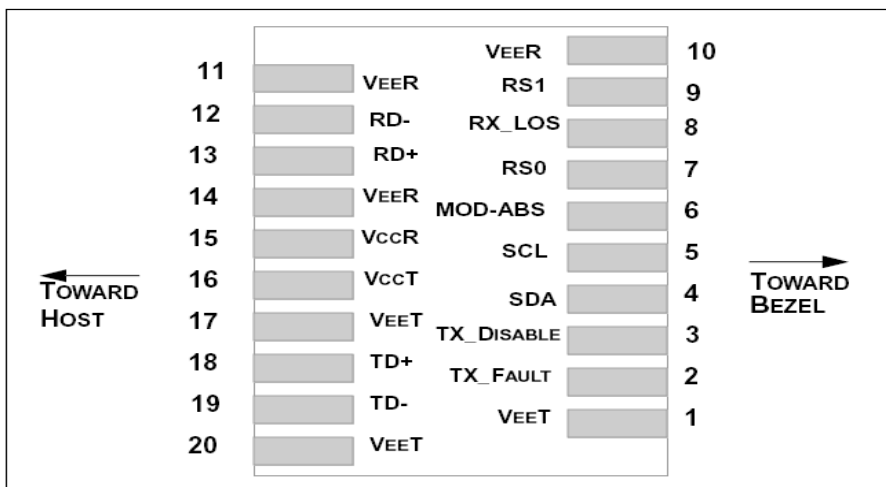
Parameter	Symbol	Min.	Typ.	Max	Unit	Notes
Transmitter						
CML Inputs(Differential)	V_{in}	150		1200	mVpp	AC coupled inputs
Input AC Common Mode Voltage		0		25	mV	RMS
Input Impedance (Differential)	Z_{in}	85	100	115	ohm	$R_{in} > 100$ kohms @ DC
Differential Input S-parameter	S_{DD11}	-	-	-10	dB	
Differential to Common Mode Conversion	S_{CD11}	-	-	-10	dB	
Tx_DISABLE Input Voltage – High		2		3.45	V	
Tx_DISABLE Input Voltage – Low		0		0.8	V	
Tx_FAULT Output Voltage – High		2		$V_{CC}+0.3$	V	$I_o = 400\mu A$; Host V_{CC}
Tx_FAULT Output Voltage – Low		0		0.5	V	$I_o = -4.0mA$
Receiver						
CML Outputs (Differential)	V_{out}	350		700	mVpp	AC coupled outputs
Output AC Common Mode Voltage		0		15	mV	RMS
Output Impedance (Differential)	Z_{out}	90	100	110	ohm	
Differential Output S-parameter	S_{D22}	-	-	-10	dB	
Rx_LOS Output Voltage – High		2		$V_{CC}+0.3$	V	$I_o = 400\mu A$; Host V_{CC}
Rx_LOS Output Voltage – Low		0		0.8	V	$I_o = -4.0mA$
MOD_DEF (0:2)	V_{oH}	2.5			V	With Serial ID
	V_{oL}	0		0.5	V	

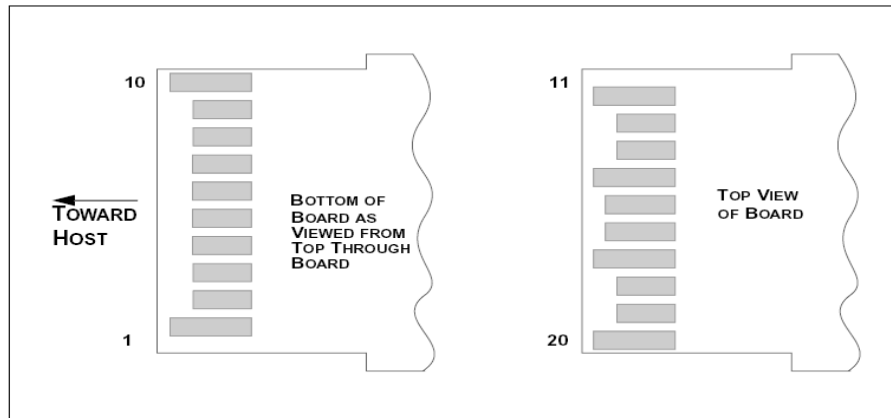
Performance Specifications – Optical

Parameter	Symbol	Min.	Typical	Max.	Unit
9 μm Core Diameter SMF			40		Km
Data Rate		0.614		11.3	Gbps
Transmitter					
Centre Wavelength	λ_C	1270	1310	1355	nm
Spectral Width (-20dB)	$\Delta\lambda$			1	nm
Side Mode Suppression Ratio	SMSR	30			dB
Average Output Power	P_{out}	-1		+4	dBm

Extinction Ratio		ER	3.5			dB
Average Power of OFF Transmitter		P_{off}			-30	dBm
Transmitter Dispersion Penalty		TDP			2	dB
Input Differential Impedance		Z_{IN}	90	100	110	Ω
TX Disable	Disable		2.0		$V_{CC}+0.3$	V
	Enable		0		0.8	
TX Fault	Fault		2.0		$V_{CC}+0.3$	V
	Normal		0		0.8	
TX Disable Assert Time		t_{off}	-	-	10	us
TX_DISABLE Negate Time		t_{on}	-	-	1	ms
TX_BISABLE time to start reset		t_{reset}	10	-	-	us
Time to initialize, include reset of TX_FAULT		t_{init}	-	-	300	ms
TX_FAULT from fault to assertion		t_{fault}	-	-	100	us
Total Jitter		TJ	-	-	0.28	UI(p-p)
Data Dependant Jitter		DDJ	-	-	0.1	UI(p-p)
Uncorrelated Jitter		UJ	-	-	0.023	RMS
Receiver						
Centre Wavelength		λ	1260		1565	nm
Sensitivity		P_{min}			-15	dBm
Receiver Overload		P_{max}	0.5			dBm
Optical Return Loss		ORL			-12	dB
LOS De-Assert		LOS_D			-16	dBm
LOS Assert		LOS_A	-25			dBm
LOS	High		2.0		$V_{CC}+0.3$	V
	Low		0		0.8	

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	Data line for Serial ID.
5	SCL	Module Definition 1	3	Clock line for Serial ID.
6	MOD-ABS	Module Definition 0	3	Note 3
7	RS0	RX Rate Select (LVTTTL).	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	Note 4
9	RS1	TX Rate Select (LVTTTL).	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	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 7
14	VeeR	Receiver Ground	1	Note 5
15	VccR	Receiver Power	2	3.3V ± 5%, Note 7
16	VccT	Transmitter Power	2	3.3V ± 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

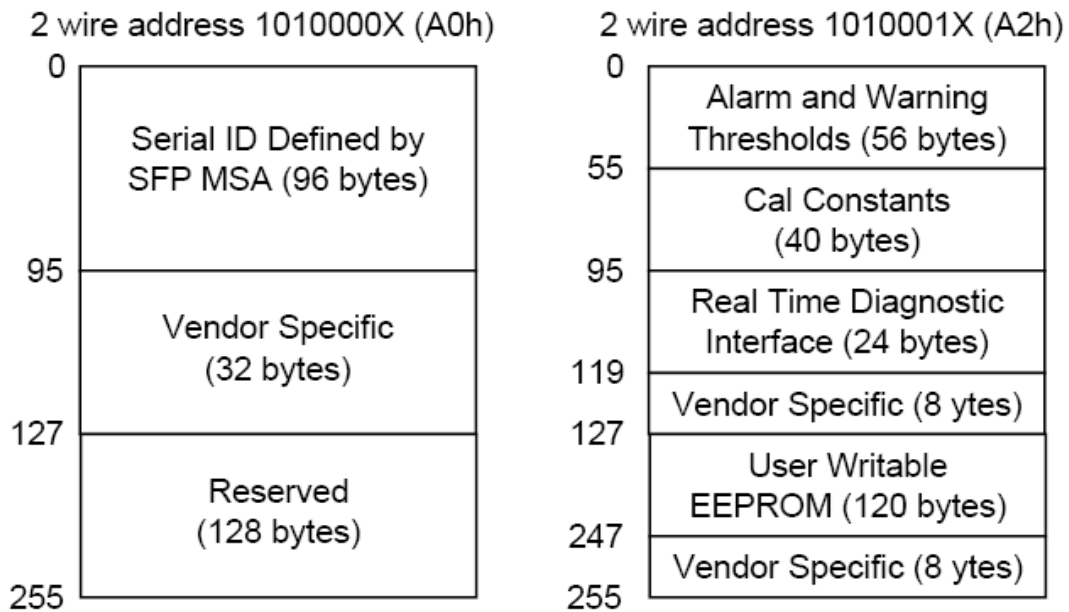
Notes:

- 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 $V_{ccT/R}+0.3V$. 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) 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 $V_{ccT/R}+0.3V$. 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.
- 7) VccR and VccT are the receiver and transmitter power supplies. They are defined as $3.3V \pm 5\%$ at the SFP+ connector pin. Maximum supply current is 300mA. 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.

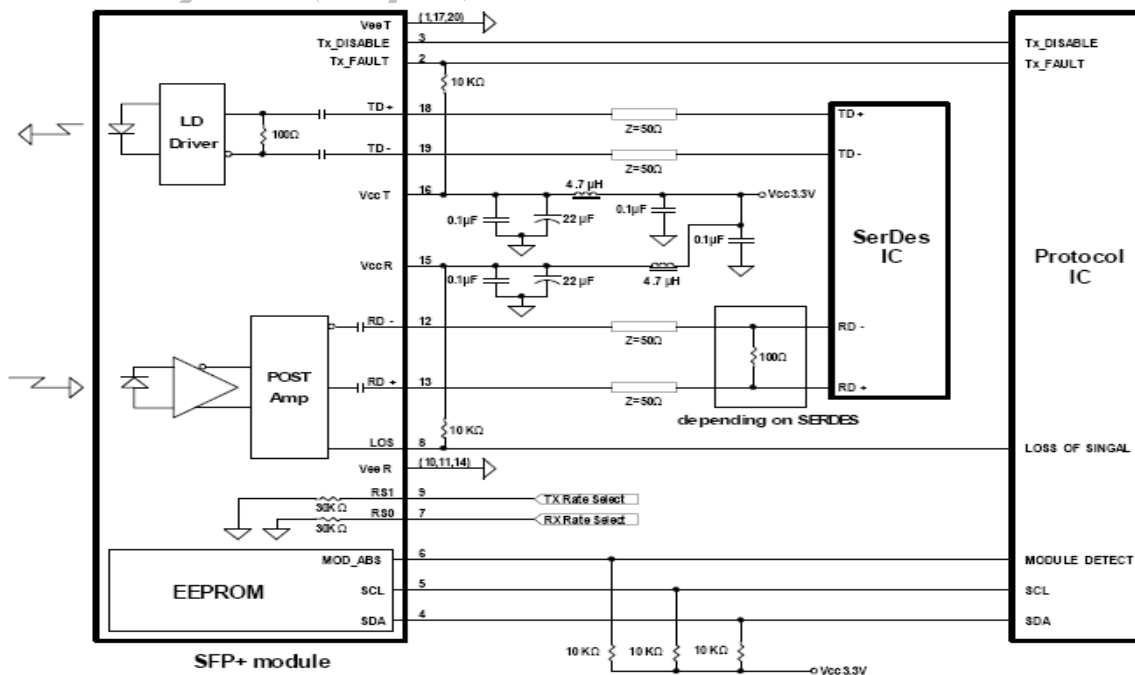
EEPROM

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 written 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.

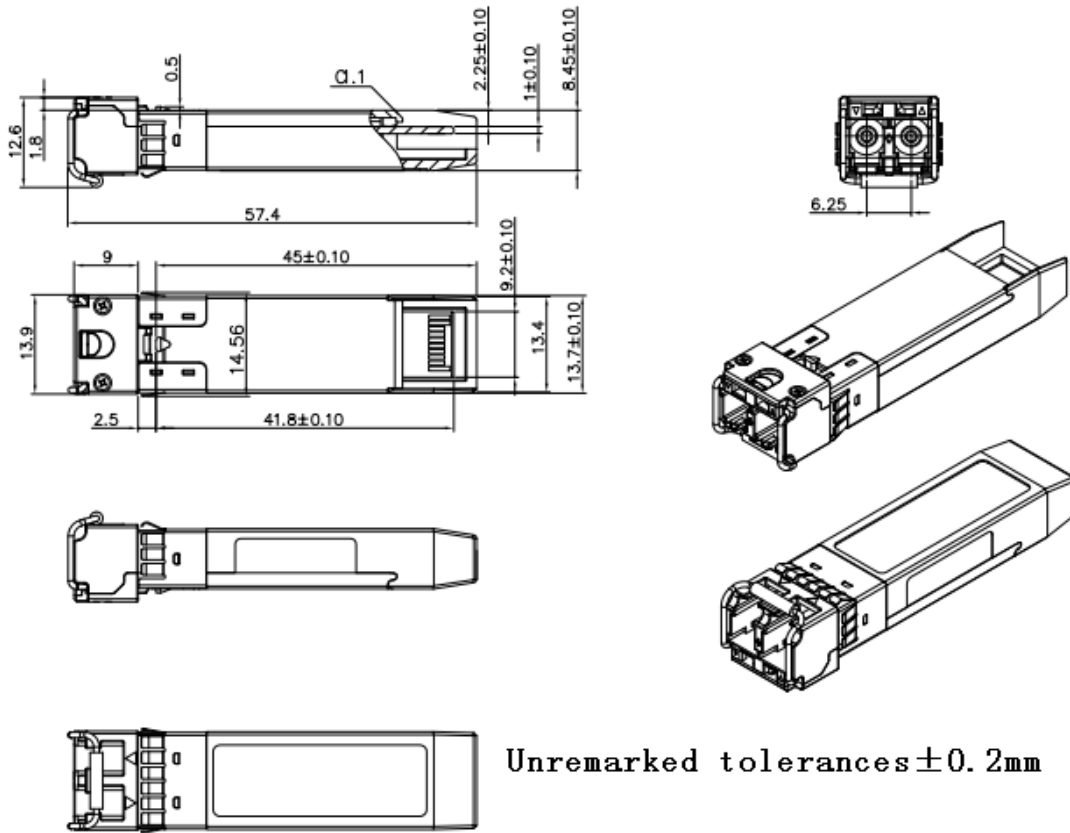
The Module provides diagnostic information about the present operating conditions. The transceiver generates this diagnostic data by digitization of internal analog signals. Calibration and alarm/warning threshold data is written during device manufacture. Received power monitoring, transmitted power 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 10.2.



Recommend Circuit Schematic



Mechanical Specifications



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	Revision History	Release Date
V1.a	Cathy			Released.	2010-12-7
V1.b	Cathy			Updated sensitivity.	2010-12-15
V1.c	Cathy			Updated output power value.	2010-11-3
V2.0	Alex/	Kelly.Cao		Update spelling mistake	Aug 10, 2011

	Townie				
V2.a	Townie	Kelly		Add power dissipation and industrial product.	Aug 23, 2011
V2.b	Kelly			Add TDP.	Sep 6, 2011
V2.c	Kelly			Add CDR products.	Jun 5, 2012
V2.d	Abby	Kelly/Vina		Update Regulatory Compliance and Mechanical Specifications	Feb 3, 2015
V2.e	Angela	Kelly/JP/Vina		Add CPRI/OBSAI application. Update temperature range and the tolerances of 2D drawing.	July 03,2015

Notice:

Eoptolink reserves the right to make changes to or discontinue any optical link product or service identified in this publication, without notice, in order to improve design and/or performance. Applications that are described herein for any of the optical link products are for illustrative purposes only. Eoptolink makes no representation or warranty that such applications will be suitable for the specified use without further testing or modification.

Contact:

Add: Floor 5 Building 2 No. 21 Gaopeng Avenue High-Tech District CHENGDU, SICHUAN 610041
P.R. CHINA

Tel: (+86) 028-85122709 ext 808 & 809

Fax: (+86) 028-85121912

Postal: 610041

E-mail:sales@eoptolink.com

<http://www.eoptolink.com>