

**LP-OSFPEX01XX**

**SFP Optical Transceiver module, 1.25Gbps 1000BASE-EX, 1310nm, Single MODE (9/125 μm), up to 40 Km**

LPOSFPEX01XX\_PFD\_ENB01W

**Features**

- Data-rate of 1.25 Gbps operation.
- 1310 nm FP laser and PIN photodetector for 40 km transmission.
- Compliant with SFP MSA and SFF-8472 with duplex LC receptacle.
- Digital Diagnostic Monitoring: Internal Calibration or External Calibration.
- Compatible with SONET OC-24-LR-1.
- Compatible with RoHS.
- +3.3V Single power supply.
- Operating case temperature: Standard: 0 to +70°C Extended: -20 to +85°C.
- Hot-pluggable SFP footprint.

**Applications**

- Gigabit Ethernet.
- Fiber Channel.
- Switch to Switch interface.
- Switched backplane applications.
- Router/Server interface.
- Other optical transmission systems.



**LP-OSFPEX01XX**

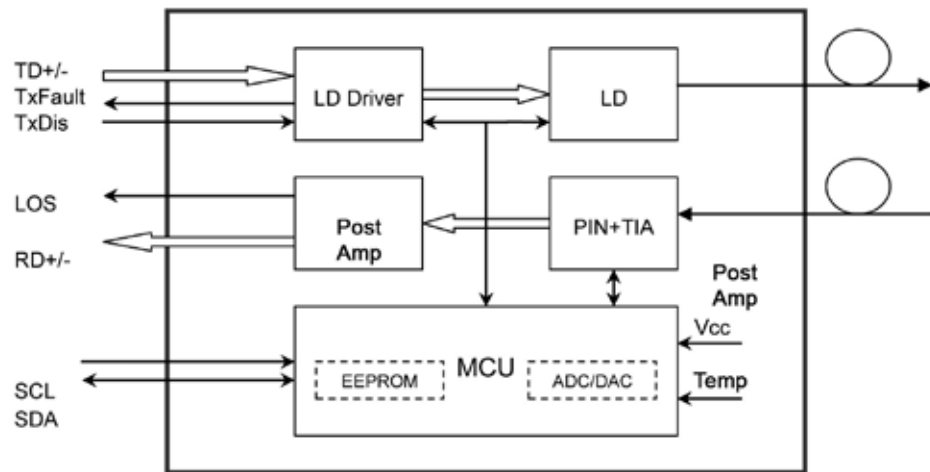
**SFP Optical Transceiver module, 1.25 Gbps 1000BASE-EX, 1310 nm, Single MODE (9/125 μm), up to 40 Km**

The SFP transceivers are high performance, cost effective modules supporting data-rate of 1.25Gbps and 40 km transmission distance with SMF.

The transceiver consists of three sections: a FP laser transmitter, a PIN photodiode integrated with a trans-impedance preamplifier (TIA) and MCU control unit. All modules satisfy class I laser safety requirements.

The transceivers are compatible with SFP Multi-Source Agreement (MSA) and SFF-8472. For further information, please refer to SFP MSA.

**Module's Block Diagram**



**A Specifications:**

**Absolute Maximum Ratings**

**Table 1 - Absolute Maximum Ratings**

Parameter	Symbol	Min.	Max.	Unit
Supply Voltage	Vcc	-0.5	4.5	V
Storage Temperature	Ts	-40	+85	°C
Operating Humidity	-	5	85	%

**Recommended Operating Conditions**

**Table 2 - Recommended Operating Conditions**

Parameter	Symbol	Min.	Typical	Max.	Unit
Operating Case Temperature	Standard	0	-	+70	°C
	Extended	-20	-	+85	°C
Power Supply Voltage	Vcc	3.13	3.3	3.47	V
Power Supply Current	Icc	-	-	300	mA
Data Rate	-	-	1.25	-	Gbps

**Optical and Electrical Characteristics**

**LPOSFPEX01xx: (FP and PIN, 1310nm, 40km Reach)**

**Table 3 - Optical and Electrical Characteristics**

Parameter	Symbol	Min.	Typical	Max.	Unit	Notes
<b>Transmitter</b>						
Centre Wavelength	$\lambda_c$	1260	1310	1360	nm	-
Spectral Width (-20dB)	$\Delta\lambda$	-	-	1	nm	-
Side Mode Suppression Ratio	SMSR	30	-	-	dB	-
Average Output Power	Pout	-5	-	0	dBm	1
Extinction Ratio	ER	9	-	-	dB	-
Optical Rise/Fall Time (20%~80%)	tr/tf	-	-	0.26	ns	-
Data Input Swing Differential	VIN	400	-	1800	mV	2
Input Differential Impedance	ZIN	90	100	110	$\Omega$	-
TX Disable	Disable	-	2.0	-	Vcc	V
	Enable	-	0	-	0.8	V
TX Fault	Fault	-	2.0	-	Vcc	V
	Normal	-	0	-	0.8	V
<b>Receiver</b>						
Centre Wavelength	$\lambda_c$	1260	-	1580	nm	-
Receiver Sensitivity	-	-	-	-23	dBm	3
Receiver Overload	-	-3	-	-	dBm	3
LOS De-Assert	LOSD	-	-	-24	dBm	-
LOS Assert	LOSA	-30	-	-	dBm	-
LOS Hysteresis	-	1	-	4	dB	-
Data Output Swing Differential	Vout	400	-	1800	mV	4
LOS	High	2.0	-	Vcc	V	-
	Low	-	-	0.8	V	-

**Notas:**

1. The optical power is launched into SMF.
2. PECL input, internally AC-coupled and terminated.
3. Measured with a PRBS 27-1 test pattern @1250Mbps, BER  $\leq 1 \times 10^{-12}$ .
4. Internally AC-coupled.

**Timing and Electrical**

**Table 4 - Timing and Electrical**

Parameter	Symbol	Min	Typical	Max	Unit
Tx Disable Negate Time	t_on			1	ms
Tx Disable Assert Time	t_off			10	$\mu$ s
Time To Initialize, including Reset of Tx Fault	t_init			300	ms
Tx Fault Assert Time	t_fault			100	$\mu$ s
Tx Disable To Reset	t_reset	10			$\mu$ s
LOS Assert Time	t_loss_on			100	$\mu$ s
LOS De-assert Time	t_loss_off			100	$\mu$ s
Serial ID Clock Rate	f_serial_clock			400	KHz
MOD_DEF (0:2)-High	VH	2		Vcc	V
MOD_DEF (0:2)-Low	VL			0.8	V

**Diagnósticos**

**Table 5 – Diagnostics Specification**

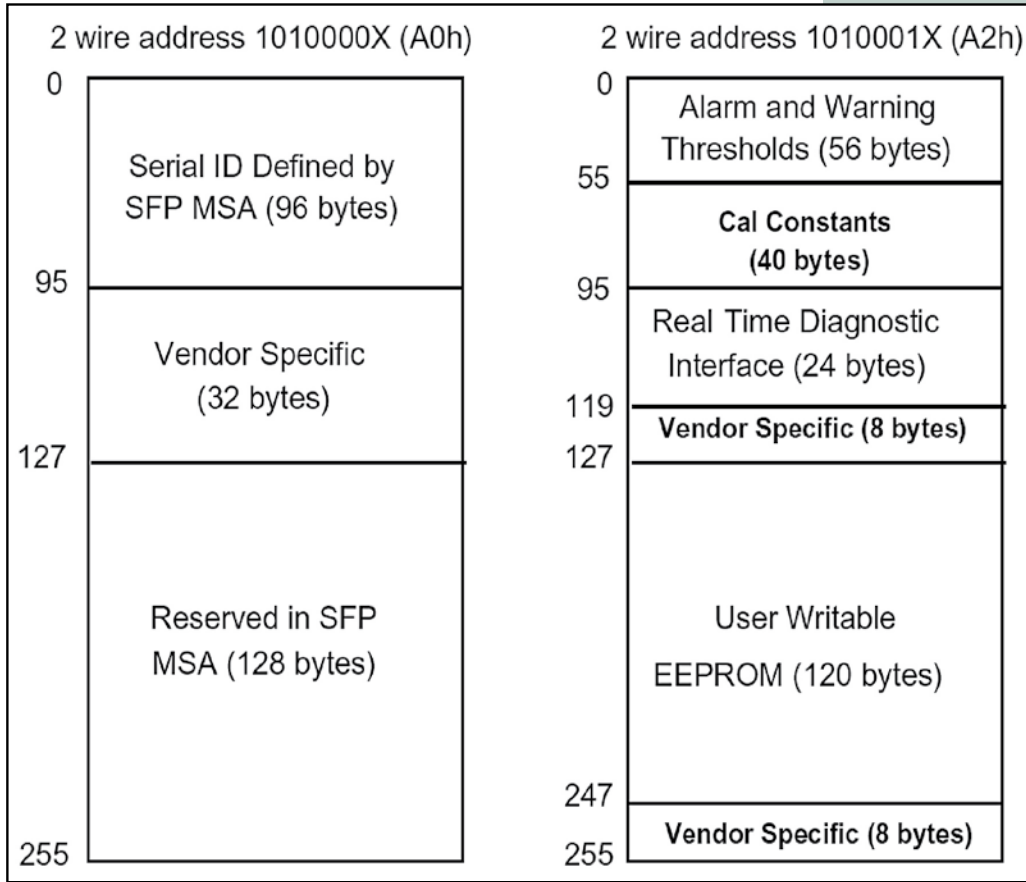
Parameter	Range	Unit	Accuracy	Calibration
Temperature	0 to +70	$^{\circ}$ C	$\pm 3^{\circ}$ C	Internal / External
	-20 to +85			
Voltage	3.0 to 3.6	V	$\pm 3\%$	Internal / External
Bias Current	0 to 100	mA	$\pm 10\%$	Internal / External
TX Power	-5 to 0	dBm	$\pm 3$ dB	Internal / External
RX Power	-23 to -3	dBm	$\pm 3$ dB	Internal / External

**Digital Diagnostic Memory Map**

The transceivers provide serial ID memory contents and diagnostic information about the present operating conditions by the 2-wire serial interface (SCL, SDA).

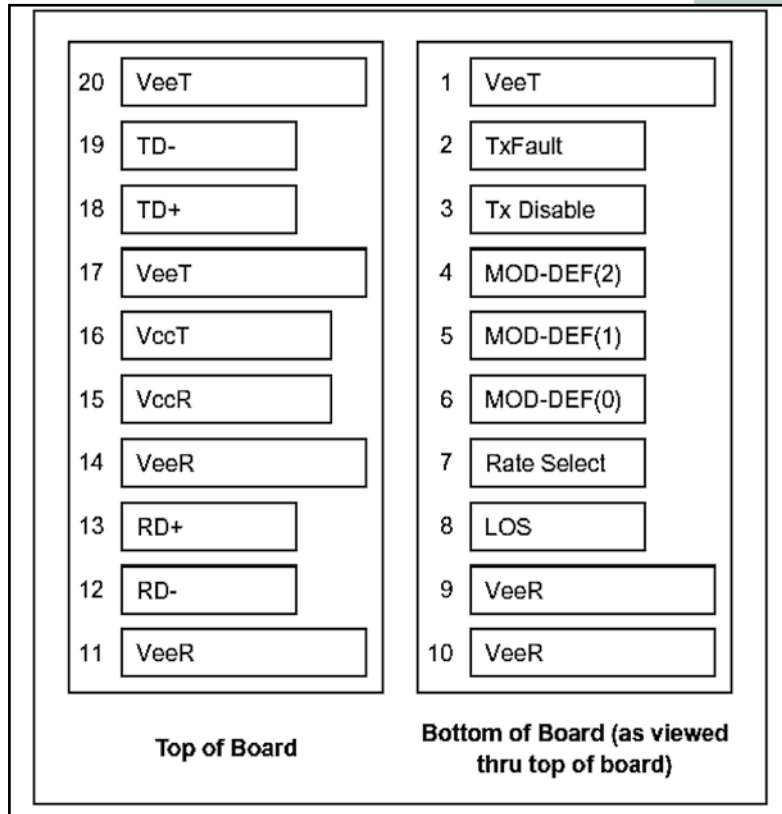
The diagnostic information with internal calibration or external calibration all are implemented, including received power monitoring, transmitted power monitoring, bias current monitoring, supply voltage monitoring and temperature monitoring.

The digital diagnostic memory map specific data field defines as following:



**B Pin Definitions**

Pin Diagram.



## C Pin Descriptions

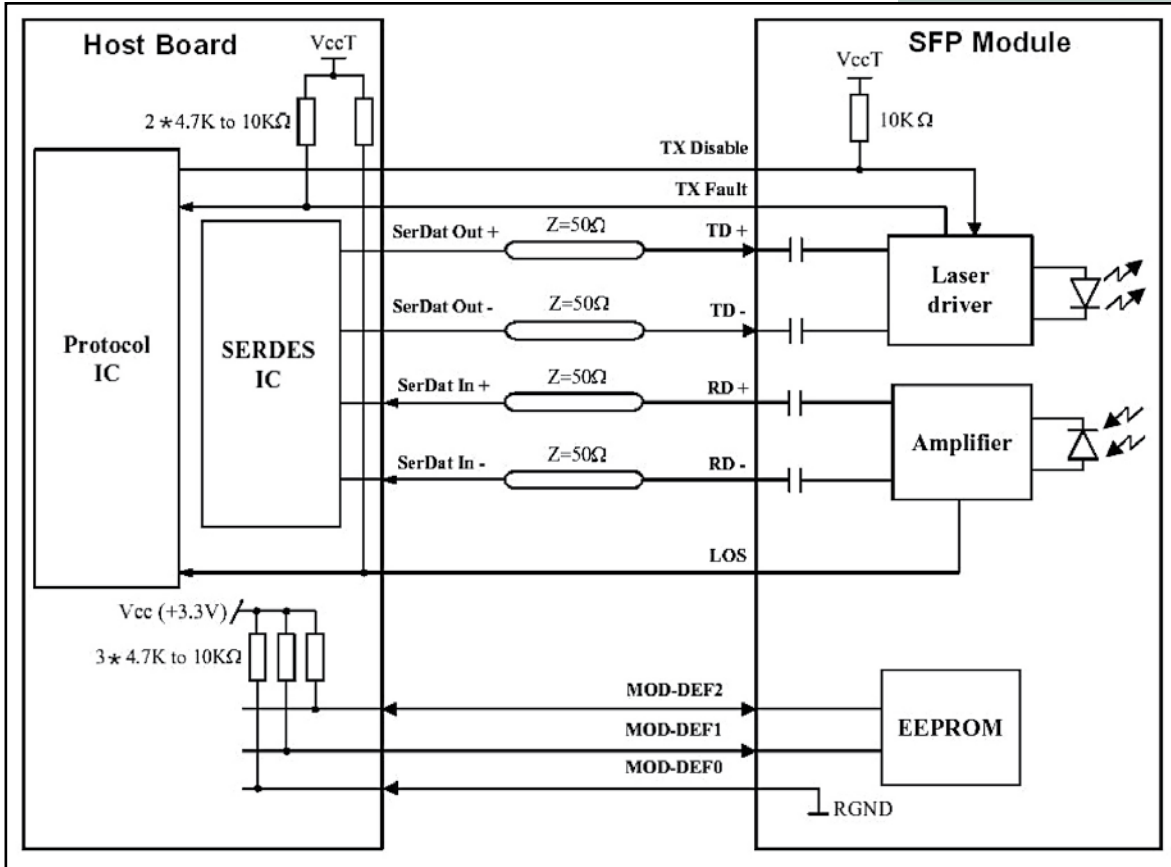
Pin	Signal Name	Description	Plug Seq.	Notes
1	V <sub>EET</sub>	Transmitter Ground	1	-
2	TX FAULT	Transmitter Fault Indication	3	Note 1
3	TX DISABLE	Transmitter Disable	3	Note 2
4	MOD_DEF(2)	SDA Serial Data Signal	3	Note 3
5	MOD_DEF(1)	SCL Serial Clock Signal	3	Note 3
6	MOD_DEF(0)	TTL Low	3	Note 3
7	Rate Select	Not Connected	3	-
8	LOS	Loss of Signal	3	Note 4
9	V <sub>EER</sub>	Receiver ground	1	-
10	V <sub>EER</sub>	Receiver ground	1	-
11	V <sub>EER</sub>	Receiver ground	1	-
12	RD-	Inv. Received Data Out	3	Note 5
13	RD+	Received Data Out	3	Note 5
14	V <sub>EER</sub>	Receiver ground	1	-
15	V <sub>CCR</sub>	Receiver Power Supply	2	-
16	V <sub>CCT</sub>	Transmitter Power Supply	2	-
17	V <sub>EET</sub>	Transmitter Ground	1	-
18	TD+	Transmit Data In	3	Note 6
19	TD-	Inv. Transmit Data In	3	Note 6
20	V <sub>EET</sub>	Transmitter Ground	1	

### Notes:

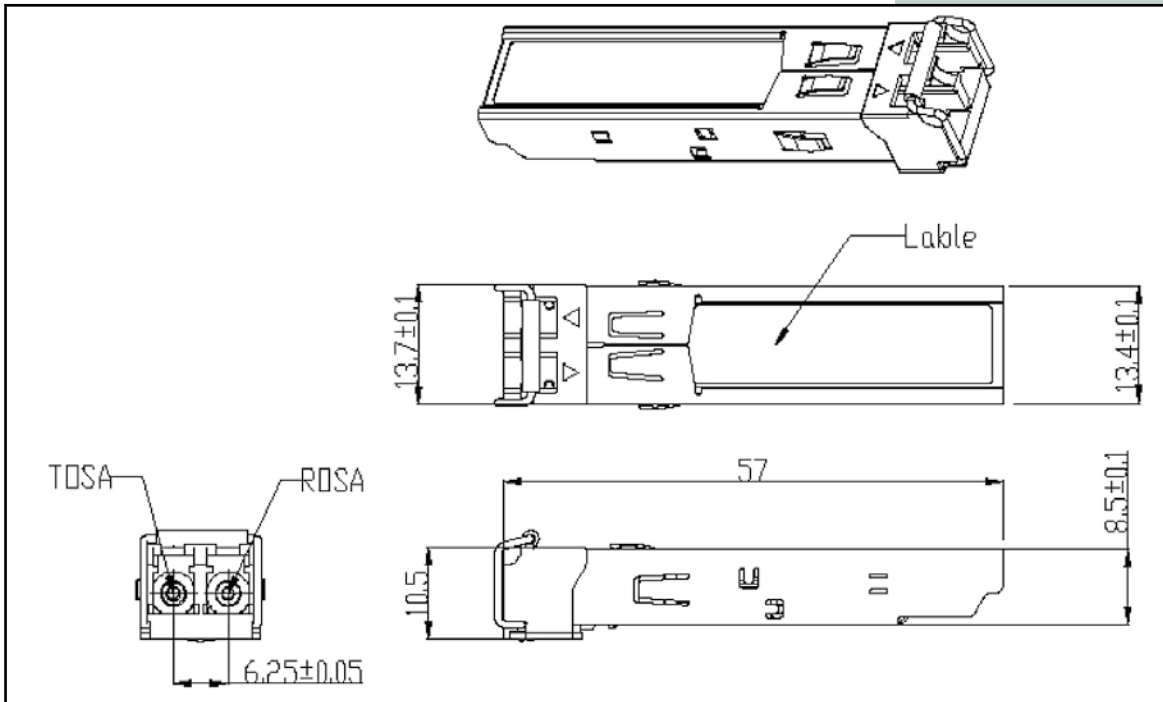
Plug Seq.: Pin engagement sequence during hot plugging.

- 1) TX Fault is an open collector output, which should be pulled up with a 4.7k~10kΩ resistor on the host board to a voltage between 2.0V and Vcc+0.3V. Logic 0 indicates normal operation; Logic 1 indicates a laser fault of some kind. In the low state, the output will be pulled to less than 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~10kΩ resistor. Its states are:
  - Low (0 to 0.8V): Transmitter on
  - (>0.8V, < 2.0V): Undefined
  - High (2.0 to 3.465V): Transmitter Disabled
  - Open: Transmitter Disabled
- 3) Mod-Def 0,1,2. These are the module definition pins. They should be pulled up with a 4.7k~10kΩ resistor on the host board. The pull-up voltage shall be VccT or VccR.  
 Mod-Def 0 is grounded by the module to indicate that the module is present  
 Mod-Def 1 is the clock line of two wire serial interface for serial ID  
 Mod-Def 2 is the data line of two wire serial interface for serial ID
- 4) LOS is an open collector output, which should be pulled up with a 4.7k~10kΩ resistor. Pull up voltage between 2.0V and Vcc+0.3V. Logic 1 indicates loss of signal; Logic 0 indicates normal operation. In the low state, the output will be pulled to less than 0.8V.
- 5) RD-/+: These are the differential receiver outputs. They are internally AC-coupled 100 differential lines which should be terminated with 100Ω (differential) at the user SERDES.
- 6) TD-/+: These are the differential transmitter inputs. They are internally AC-coupled, differential lines with 100Ω differential termination inside the module.

**D Recommended Interface Circuit**



**E Mechanical Dimensions**



Part Number	Options
LP-OSFPEX01	1310 nm, 1.25 Gbps, 40 km, 0 °C ~ +70 °C
LP-OSFPEX01D	1310 nm, 1.25 Gbps, 40 km, 0°C ~ +70 °C, With Digital Diagnostic Monitoring
LP-OSFPEX01E	1310 nm, 1.25 Gbps, 40 km, -20 °C ~ +85 °C
LP-OSFPEX01DE	1310 nm, 1.25 Gbps, 40 km, -20 °C ~ +85 °C, With Digital Diagnostic Monitoring

**F How to Order:**

<b>LP-OSFPEX01</b>	SFP Optical Transceiver module, 1.25 Gbps 1000BASE-EX, 1310 nm, Single MODE (9/125 μm), up to 40 Km, 0-70 °C
<b>LP-OSFPEX01D</b>	SFP Optical Transceiver module, 1.25 Gbps 1000BASE-EX, 1310 nm, Single MODE (9/125 μm), up to 40 Km, 0-70 °C, with DDM
<b>LP-OSFPEX01E</b>	SFP Optical Transceiver module, 1.25 Gbps 1000BASE-EX, 1310 nm, Single MODE (9/125 μm), up to 40 Km, Extended temperature -25 to +85 °C
<b>LP-OSFPEX01DE</b>	SFP Optical Transceiver module, 1.25Gbps 1000BASE-EX, 1310 nm, Single MODE (9/125 μm), up to 40 Km, Extended temperature -25 to +85 °C, with DDM