

## **1000BASE-LH SFP 1310nm 20KM DDM SMF Transceiver**

### **P/N: AE-SFP-LH**

#### **Features**

- Dual data-rate of 1.25Gbps/1.063Gbps operation
- 1310nm FP laser and PIN photodetector for 20km 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 Industrial: -40 to +85°C

#### **Applications**

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

## I. Absolute Maximum Ratings

Parameter	Symbol	Min	Max	Unit
Supply Voltage	V <sub>cc</sub>	-0.5	4.5	V
Storage Temperature	T <sub>s</sub>	-40	+85	°C
Operating Humidity	-	5	85	%

## II. Recommended Operating Conditions

Parameter	Symbol	Min	Typical	Max	Unit	
Operating Case Temperature	Standard	T <sub>c</sub>	0		+70	°C
	Industrial		-40		+85	°C
Power Supply Voltage	V <sub>cc</sub>	3.13	3.3	3.47	V	
Power Supply Current	I <sub>cc</sub>			300	mA	
Data Rate	Gigabit Ethernet		1.25		Gbps	
	Fiber Channel		1.063			

## III. Optical and Electrical Characteristics

Parameter	Symbol	Min	Typical	Max	Unit	Notes
<b>Transmitter</b>						
Centre Wavelength	$\lambda_c$	1260	1310	1360	nm	
Spectral Width (RMS)	$\Delta\lambda$			4	nm	
Average Output Power	P <sub>out</sub>	-9.5		-3	dBm	1
Extinction Ratio	ER	9			dB	
Optical Rise/Fall Time (20%~80%)	tr/tf			0.26	ns	
Data Input Swing Differential	V <sub>IN</sub>	400		1800	mV	2
Input Differential Impedance	Z <sub>IN</sub>	90	100	110	$\Omega$	
TX Disable	Disable	2.0		V <sub>cc</sub>	V	
	Enable	0		0.8	V	
TX Fault	Fault	2.0		V <sub>cc</sub>	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	LOS <sub>D</sub>			-22	dBm	
LOS Assert	LOS <sub>A</sub>	-35			dBm	
LOS Hysteresis		1		4	dB	
Data Output Swing Differential	V <sub>out</sub>	400		1800	mV	4
LOS	High	2.0		V <sub>cc</sub>	V	
	Low			0.8	V	

### Notes:

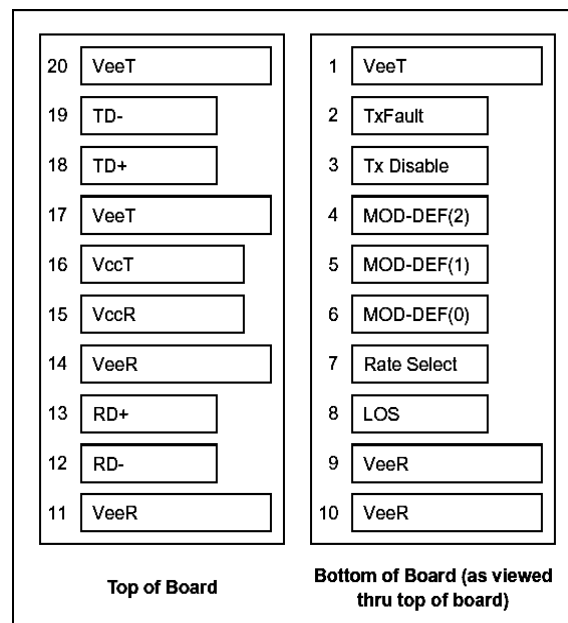
- The optical power is launched into SMF.
- PECL input, internally AC-coupled and terminated.

3. Measured with a PRBS 27-1 test pattern @1250Mbps, BER  $\leq 1 \times 10^{-12}$ . 4. Internally AC-coupled.

## IV. 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	V <sub>H</sub>	2		V <sub>cc</sub>	V
MOD_DEF (0:2)-Low	V <sub>L</sub>			0.8	V

## V. Pin Definitions



## VI. 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 V<sub>cc</sub>+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 V<sub>ccT</sub> or V<sub>ccR</sub>.

*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 V<sub>cc</sub>+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.

## VII. Ordering information

Part Number	Product Description
AE-SFP-LH	SFP, 1.25Gb/s, 1310nm, SMF, 20KM, DDM, LC connector, 0°C to +70°C
AE-SFP-LHI	SFP, 1.25Gb/s, 1310nm, SMF, 20KM, DDM, LC connector, -40°C to +85°C