1.25 Gb/s 1310 nm Single-mode SFP Transceiver

SFP Transceiver Series

- **Up to 1.25 Gb/s data links**
- **FP laser transmitter and PIN photo-detector**
- **Up to 20 km on 9/125 μm SMF**
- **Hot-pluggable SFP footprint**
- **Duplex LC/UPC type pluggable optical interface**
- **Low power dissipation**
- **Metal enclosure, for lower EMI**
- **RoHS compliant and lead-free**
- **Single +3.3V power supply**
- **Support Digital Diagnostic Monitoring interface**
- **Compliant with SFF-8472**

ASCENT's SFP-AG-LP-31-20 Small Form Factor Pluggable (SFP) transceivers are compatible with the Small Form Factor Pluggable Multi-Sourcing Agreement (MSA). The transceiver consists of five sections: the LD driver, the limiting amplifier, the digital diagnostic monitor, the 1310nm FP laser and the PIN/TIA. The module data link up to 20 km in 9/125 μm Single-mode fiber.

This transceiver meets the Small Form Pluggable (SFP) industry standard package utilizing an integral LC-Duplex optical interface connector. An enhanced Digital Diagnostic Monitoring Interface compliant with SFF-8472 has been incorporated into the transceiver. It allows real time access to the transceiver operating parameters such as transceiver temperature, laser bias current, transmitted optical power, and received optical power and transceiver supply voltage by reading a built-in memory with I2C interface.

The optical output can be disabled by a LVTTL logic high-level input of Tx Disable, and the system also can disable the module via I2C. Tx Fault is provided to indicate that degradation of the laser. Loss of Signal (LOS) output is provided to indicate the loss of an input optical signal of receiver or the link status with partner. The system can also get the LOS (or Link)/Disable/Fault information via I2C register access.

Key Features

- Up to 1.25 Gb/s data links

- FP laser transmitter and PIN photo-detector

- Up to 20 km on 9/125 µm SMF

- Hot-pluggable SFP footprint

- Duplex LC/UPC type pluggable optical interface

- Low power dissipation

- Metal enclosure, for lower EMI

- RoHS compliant and lead-free

- Single +3.3V power supply

- Support Digital Diagnostic Monitoring interface

- Compliant with SFF-8472

- Switch to Switch Interface

- Gigabit Ethernet

- Switched Backplane Applications

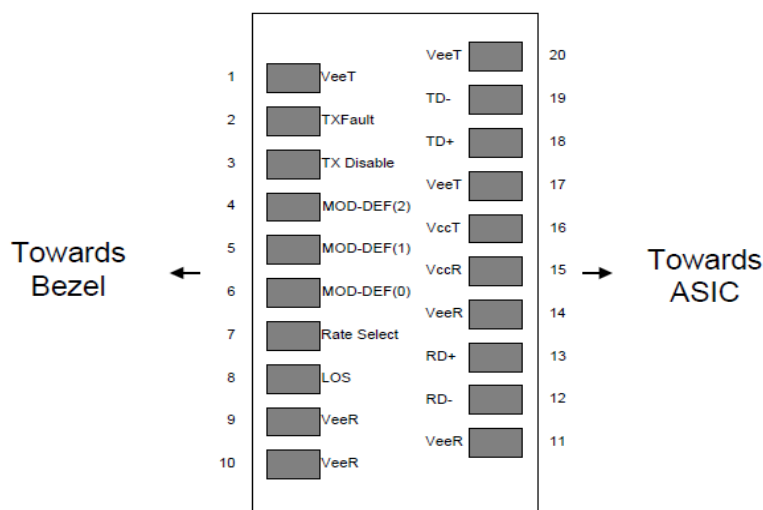- Router/Server Interface

- Other Optical Links

Outline Diagram
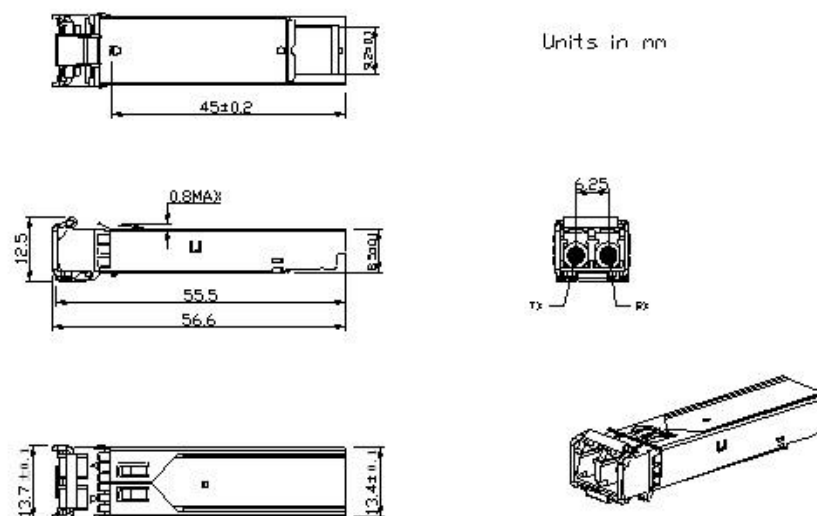
SFP-AG-LP-31-20

Recommend Circuit Schematic
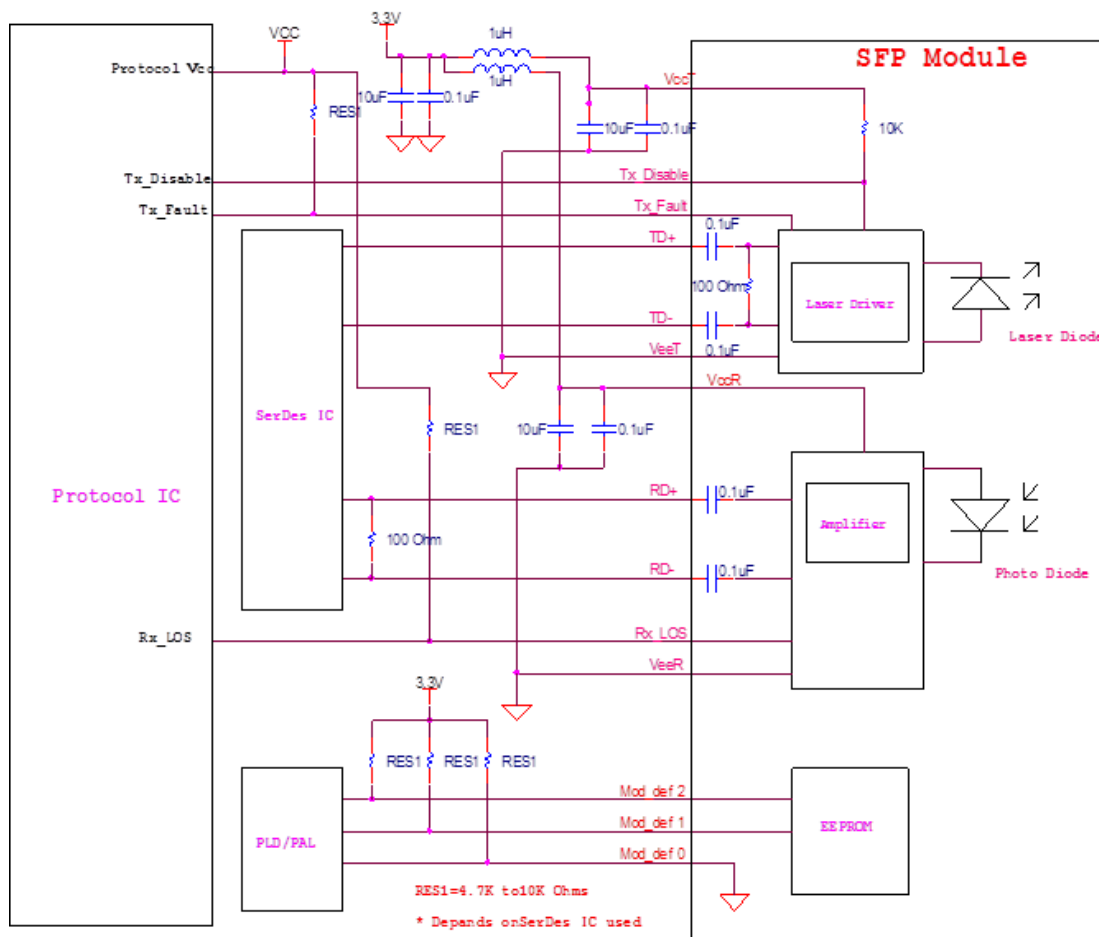
Pin Description

Pin out of Connector Block on Host Board

Pin Descriptions

Pin	Symbol	Name/Description	NOTE
1	V_{EET}	Transmitter Ground (Common with Receiver Ground)	1
2	T_{FAULT}	Transmitter Fault.	
3	T_{DIS}	Transmitter Disable. Laser output disabled on high or open.	2
4	MOD_DEF(2)	Module Definition 2. Data line for Serial ID.	3
5	MOD_DEF(1)	Module Definition 1. Clock line for Serial ID.	3
6	MOD_DEF(0)	Module Definition 0. Grounded within the module.	3
7	Rate Select	No connection required	4
8	LOS	Loss of Signal indication. Logic 0 indicates normal operation.	5
9	V_{EER}	Receiver Ground (Common with Transmitter Ground)	1
10	V_{EER}	Receiver Ground (Common with Transmitter Ground)	1
11	V_{EER}	Receiver Ground (Common with Transmitter Ground)	1
12	RD-	Receiver Inverted DATA out. AC Coupled	
13	RD+	Receiver Non-inverted DATA out. AC Coupled	
14	V_{EER}	Receiver Ground (Common with Transmitter Ground)	1
15	V_{CCR}	Receiver Power Supply	
16	V_{CCT}	Transmitter Power Supply	
17	V_{EET}	Transmitter Ground (Common with Receiver Ground)	1
18	TD+	Transmitter Non-Inverted DATA in. AC Coupled.	
19	TD-	Transmitter Inverted DATA in. AC Coupled.	
20	V_{EET}	Transmitter Ground (Common with Receiver Ground)	1

Notes:

1. Circuit ground is internally isolated from chassis ground.

2. Laser output disabled on T_{DIS} >2.0V or open, enabled on T_{DIS} <0.8V.

3. Should be pulled up with 4.7k - 10kΩs on host board to a voltage between 2.0V and 3.6V.MOD_DEF (0) pulls line low to indicate module is plugged in.

4. This is an optional input used to control the receiver bandwidth for compatibility with multiple data rates (most likely Fiber Channel 1x and 2x Rates).If implemented, the input will be internally pulled down with > 30kΩ resistor. The input states are:

   • Low (0 – 0.8V):   Reduced Bandwidth

   • (>0.8, < 2.0V):   Undefined

   • High (2.0 – 3.465V): Full Bandwidth

   • Open: Reduced Bandwidth

5. LOS is open collector output should be pulled up with 4.7k - 10kΩs on host board to a voltage between 2.0V and 3.6V. Logic 0 indicates normal operation; logic 1 indicates loss of signal.

Specifications

Absolute Maximum Ratings

Parameter	Symbol	Min.	Typ.	Max.	Unit	Note
Storage Temperature	T_s	-40		85	°C	
Relative Humidity	R_H	5		95	%	
Power Supply Voltage	V_{CC}	-0.5		4	V	
Signal Input Voltage		-0.3		$V_{CC}+0.3$	V	
Receiver Damage Threshold		+5			dBm	

Recommended Operating Conditions

Parameter	Symbol	Min.	Typ.	Max.	Unit	Note
Case Operating Temperature	T_{case}	0		70	°C	SFP-AG-LP-31-20
		-10		80		SFP-AG-LP-31-20E
		-40		85		SFP-AG-LP-31-20A
Power Supply Voltage	V_{CC}	3.13	3.3	3.47	V	
Power Supply Current	I_{CC}			280	mA	
Power Supply Noise Rejection				100	mVp-p	100 Hz to 1 MHz
Data Rate			1.25/1.25		Gbps	TX Rate/RX Rate
Transmission Distance				20	km	
Coupled Fiber	Single-mode fiber					9/125 µm SMF

Transmitter Specifications

Parameter	Symbol	Min.	Typ.	Max.	Unit	Note
Average Output Power	P_{OUT}	-9		-3	dBm	1
Extinction Ratio	E_R	9			dB	
Center Wavelength	λ_C	1270	1310	1360	nm	FP Laser
Spectrum Bandwidth (RMS)	σ			3.5	nm	
Transmitter OFF Output Power	P_{Off}			-45	dBm	
Differential Line Input Impedance	R_{IN}	90	100	110	Ω	
Output Eye Mask	Compliant with IEEE802.3 z (class 1 laser safety)					2

Note

1. Measure at 2^7-1 NRZ PRBS pattern.
2. Transmitter eye mask definition
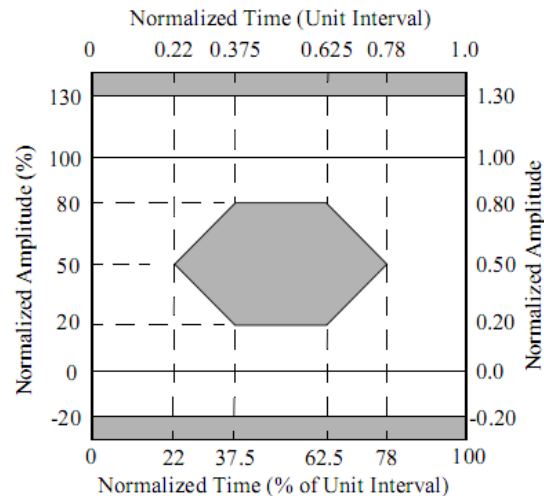
Receiver Specifications

Parameter	Symbol	Min.	Typ.	Max.	Unit	Note
Input Optical Wavelength	λ_{IN}	1270		1610	nm	PIN-TIA
Receiver Sensitivity	P_{IN}			-20	dBm	1
Input Saturation Power (Overload)	P_{SAT}	-3			dBm	
Loss Of Signal Assert	P_A			-22	dBm	
Loss Of Signal De-assert	P_D	-35			dBm	2
LOS Hysteresis	P_A-P_D	0.5	2	6	dB	

Notes

1. Measured with Light source 1310nm, ER=9dB; BER =<10^-12 @PRBS=2^7-1 NRZ.
2. When SD De-Assert, the RX-LOS output is High-level (fixed).

Electrical Interface Characteristics

Parameter	Symbol	Min.	Typ.	Max.	Unit	Note
Transmitter						
Total Supply Current	I_{CC}			A	mA	1
Transmitter Disable Input-High	V_{DISH}	2		V_{CC}+0.3	V	
Transmitter Disable Input-Low	V_{DISL}	0		0.8	V	
Transmitter Fault Input-High	V_{TxFH}	2		V_{CC}+0.3	V	
Transmitter Fault Input-Low	V_{TxFL}	0		0.8	V	
Receiver						
Total Supply Current	I_{CC}			B	mA	1
LOSS Output Voltage-High	V_{LOSH}	2		V_{CC}+0.3	V	LVTTL
LOSS Output Voltage-Low	V_{LOSL}	0		0.8	V	

Note

1. A (TX) + B (RX) = 280mA (Not include termination circuit)

Digital Diagnostic Functions

ASCENT SFP-AG-LP-31-20 transceivers support the 2-wire serial communication protocol as defined in the SFP MSA. It is very closely related to the E2PROM defined in the GBIC standard, with the same electrical specifications. The standard SFP serial ID provides access to identification information that describes the transceiver's capabilities, standard interfaces, manufacturer, and other information.

Additionally, ASCENT SFP transceivers provide a unique enhanced digital diagnostic monitoring interface, which allows real-time access to device operating parameters such as transceiver temperature, laser bias current, transmitted optical power, received optical power and transceiver supply voltage .It also defines a sophisticated system of alarm and warning flags, which alerts end-users when particular operating parameters are outside of a factory set normal range.

The SFP MSA defines a 256-byte memory map in E2PROM that is accessible over a 2-wire serial interface at the 8 bit address 1010000X (A0h). The digital diagnostic monitoring interface makes use of the 8 bit address 1010001X (A2h), so the originally defined serial ID memory map remains unchanged. The interface is identical to, and is thus fully backward compatible with both the GBIC Specification and the SFP Multi Source Agreement.

The operating and diagnostics information is monitored and reported by a Digital Diagnostics Transceiver Controller (DDTC) inside the transceiver, which is accessed through a 2-wire serial interface. When the serial protocol is activated, the serial clock signal (SCL, Mod Def 1) is generated by the host. The positive edge clocks data into the SFP transceiver into those segments of the E2PROM that are not write-protected. The negative edge clocks data from the SFP transceiver. The serial data signal (SDA, Mod Def 2) 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.

Digital diagnostics for the SFP-AG-LP-31-20 are internally calibrated by default.

Ordering Information

Product Model	Product Description
SFP-AG-LP-31-20	SFP Plug-in, 1.25 Gbps, 10km, TX=1310/RX wide, on two single mode fibers, LC/PC Blue
SFP-AG-LP-31-20E	SFP Plug-in, 1.25 Gbps, 10km, TX=1310/RX wide, on two single mode fibers, LC/PC Blue, extended temp.
SFP-AG-LP-31-20A	SFP Plug-in, 1.25 Gbps, 10km, TX=1310/RX wide, on two single mode fibers, LC/PC Blue, industrial temp.

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