

2.5 Gb/s 1310 nm Single-mode SFP Transceiver

SFP Transceiver Series



- Up to 2.5 Gb/s data links
- FP laser transmitter and PIN photodetector
- Up to 2 km on 9/125 μ m 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
- Supports the Digital Diagnostic Monitoring interface
- SFF-8472 compliant

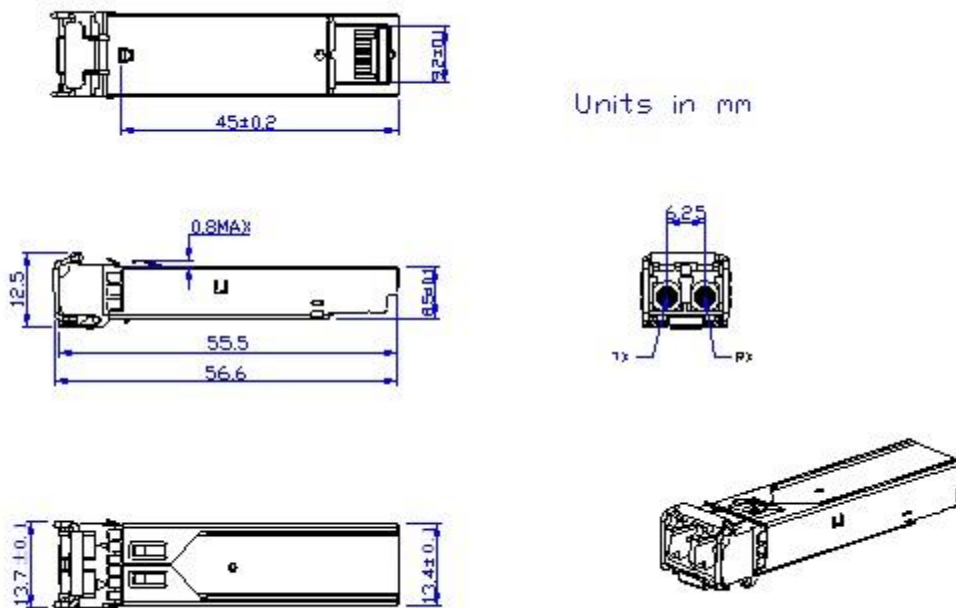
Ascent's 2.5 Gb/s 1310 nm Small Form-Factor Pluggable (SFP) transceiver is a flexible solution as an interface for switches, routers, servers, and other optical links. The transceiver consists of five sections: the LD driver, the limiting amplifier, the digital diagnostics monitor, the 1310 nm FP laser, and the PIN photo-detector. The module can carry data links up to 2 km in a 9/125 μ m single mode fiber, and is compatible with the SFP Multi-Sourcing Agreement (MSA).

The optical output of the transceiver can be disabled using a high-level TTL logic TX disable input, and the system can also be disabled via I2C. TX Fault is provided to indicate any degradation of the laser. A loss of signal (LOS) output is provided to indicate if there are any losses in the input optical signal of the receiver or if there are any problems with the link status of partner devices. The system can also obtain the LOS (or Link) / Disable / Fault information using an I2C register access.

Key Features

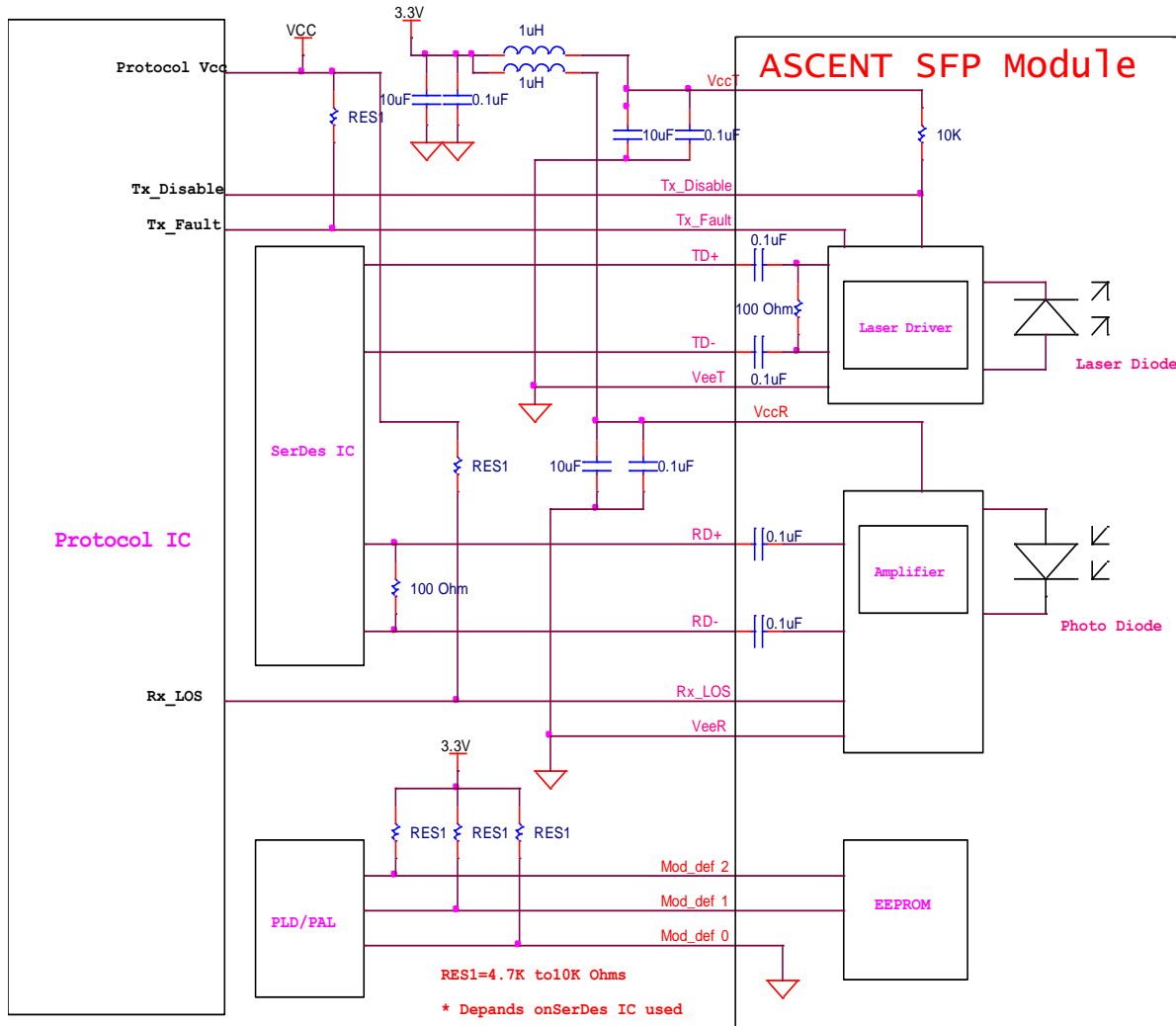
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Outline Diagram

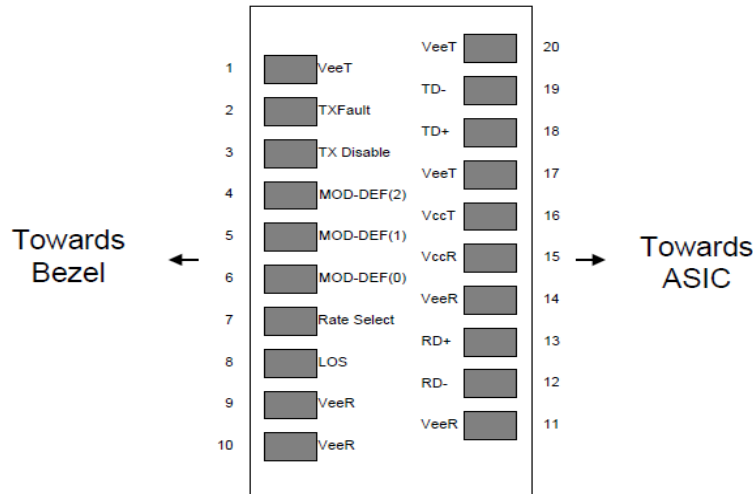


SFP-2G-LP-31-2K

Recommend Circuit Schematic



Pin Descriptions



Pin out of Connector Block on Host Board

Pin	Symbol	Name/Description	Note
1	VEET	Transmitter Ground (Common with Receiver Ground).	1
2	TFAULT	Transmitter Fault.	
3	TDIS	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	VEER	Receiver Ground (Common with Transmitter Ground).	1
10	VEER	Receiver Ground (Common with Transmitter Ground).	1
11	VEER	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	VEER	Receiver Ground (Common with Transmitter Ground).	1
15	VCCR	Receiver Power Supply.	
16	VCCT	Transmitter Power Supply.	
17	VEET	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	VEET	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, and enabled on $T_{DIS} < 0.8V$.
3. Should be pulled up with 4.7k – 10kΩ on the host board to a voltage between 2.0V and 3.6V. MOD_DEF (0) pulls

the line low to indicate that the 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 a $> 30k\Omega$ 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

LOS is an open collector output which should be pulled up with 4.7k - 10k Ω on the 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	Ts	-40		85	°C	
Relative Humidity	RH	5		95	%	
Power Supply Voltage	VCC	-0.5		4	V	
Signal Input Voltage		-0.3		Vcc+0.3	V	
Receiver Damage Threshold		5			dBm	

Recommended Operating Conditions

Parameter	Symbol	Min.	Typ.	Max.	Unit	Note
Case Operating Temperature	Tcase	0		70	°C	SFP-2G-LP-31-2K
		-10		80		SFP-2G-LP-31-2KE
		-40		85		SFP-2G-LP-31-2KA
Power Supply Voltage	VCC	3.13	3.3	3.47	V	
Power Supply Current	ICC			280	mA	
Power Supply Noise Rejection				100	mVp-p	100 Hz to 1 MHz
Data Rate			2500/2500		Mbps	TX Rate/RX Rate
Transmission Distance				2	kM	
Coupled Fiber	Single-mode fiber					9/125 μ m SMF

Transmitter Specifications

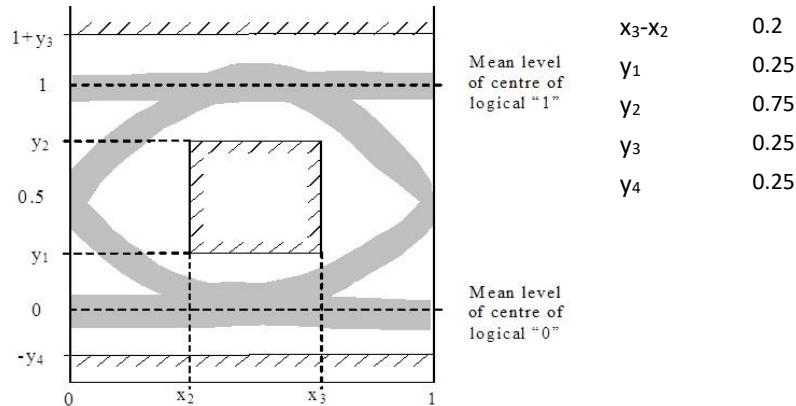
Parameter	Symbol	Min.	Typ.	Max.	Unit	Note
Average Output Power	POUT	-9		-3	dBm	1
Extinction Ratio	ER	8.2			dB	
Center Wavelength	λ C	1270	1310	1360	nm	FP Laser
Spectrum Bandwidth (RMS)	σ			3.5	nm	

Transmitter OFF Output Power	POff	-45	dBm
Differential Line Input Impedance	RIN	90 100 110	Ω
Output Eye Mask	Compliant with G.957(class 1 laser safety)		
			2

Notes:

1: Measured at a 2²³-1 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	PIN			-18	dBm	1
Input Saturation Power (Overload)	PSAT	-3			dBm	
Loss of Signal Assert	PA			-19	dBm	
Loss of Signal De-assert	PD	-35			dBm	2
LOS Hysteresis	PA-PD	0.5	2	6	dB	

Notes

1: Measured with light source 1310 nm, ER=8.2 dB; BER = $\leq 10^{-12}$ @ PRBS=2²³-1 NRZ

2: When LOS de-asserted, the RX data+/- output is high-level (fixed)

Electrical Interface Characteristics

Parameter	Symbol	Min.	Typ.	Max.	Unit	Notes
Transmitter						
Total Supply Current	ICC			A	mA	1
Transmitter Disable Input-High	VDISH	2		V _{CC} +0.3	V	
Transmitter Disable Input-Low	VDISL	0		0.8	V	
Transmitter Fault Input-High	VTxFH	2		V _{CC} +0.3	V	
Transmitter Fault Input-Low	VTxFL	0		0.8	V	
Receiver						
Total Supply Current	ICC			B	mA	1

LOSS Output Voltage-High	VLOSH	2	Vcc+0.3	V	LVTTL
LOSS Output Voltage-Low	VLOSL	0	0.8	V	

Note:

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

Regulatory Compliance

Feature	Reference	Performance
Electrostatic Discharge(ESD)	IEC/EN 61000-4-2	Compatible with standards
Electromagnetic Interference (EMI)	FCC Part 15 Class B EN 55022 Class B (CISPR 22A)	Compatible with standards
Laser Eye Safety	FDA 21CFR 1040.10, 1040.11 IEC/EN 60825-1, 2	Class 1 laser product
Component Recognition	IEC/EN 60950 , UL	Compatible with standards
ROHS	2002/95/EC	Compatible with standards
EMC	EN61000-3	Compatible with standards

Digital Diagnostic Functions

Ascent SFP-2G-LP-31-2K 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 alarms 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-2G-LP-31-2K are internally calibrated by default.

Ordering Information

Part Number	Description
SFP-2G-LP-31-2k	SFP plug-in, 2.5 Gbps, 2 km, TX=1310/RX wide, on two single-mode fibers, LC/PC

Note: Contact ACT for additional product variations on input & output options

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