

## 10 Gb/s BIDI SFP+ Transceiver

### 10 km



- **Up to 11.3 Gb/s data links**
- **Up to 10 km transmission distance on SMF**
- **Metal enclosure**
- **<1.0 W power dissipation**
- **Hot-pluggable SFP+ footprint**
- **Compliant with SFF 8431 and SFF 8472**
- **10GBASE-BX**
- **10G SONET/SDH, OTU2/2e**
- **RoHS Compliant**

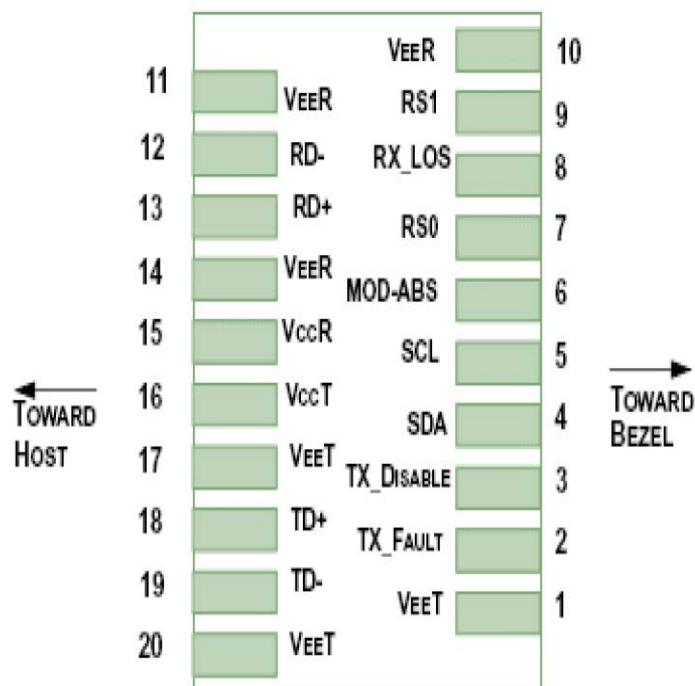
Ascent's SFPP-AT-LP-XXXX-10 transceivers are designed expressly for high-speed communication applications that require rates up to 11.3 Gb/s. They are designed to be compliant with the SFF-8472 SFP+ MSA. The module is suitable for data links up to 10 km in distance over a 9/125  $\mu$ m single mode fiber.

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.

## Key Features

- Up to 11.3 Gbps Data Links
- Up to 10 km transmission on SMF
- Power dissipation < 1.0 W
- 1270 nm DFB laser and PIN receiver for SFPP-AT-LP-2733-10
- 1330 nm DFB laser and PIN receiver for SFPP-AT-LP-3327-10
- 2-wire interface with integrated Digital Diagnostic monitoring
- EEPROM with serial ID functionality
- Compliant with SFP+ MSA with LC connector
- Compliant with SFF 8431 and SFF 8472
- Compliant with 802.3ae 10GBASE-LR/LW
- Single +3.3 V power supply

## Pin Assignment



## Diagram of Host Board Connector Block Pin Numbers and Name

Pin	Symbol	Name/Description	NOTE
1	$V_{EET}$	Transmitter Ground (Common with Receiver Ground)	1
2	$T_{FAULT}$	Transmitter Fault.	2
3	$T_{DIS}$	Transmitter Disable. Laser output disabled on high or open.	3
4	SDA	2-wire Serial Interface Data Line	4
5	SCL	2-wire Serial Interface Clock Line	4
6	MOD_ABS	Module Absent. Grounded within the module	4
7	RS0	Rate Select 0	5
8	LOS	Loss of Signal indication. Logic 0 indicates normal operation.	6
9	RS1	No connection required	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

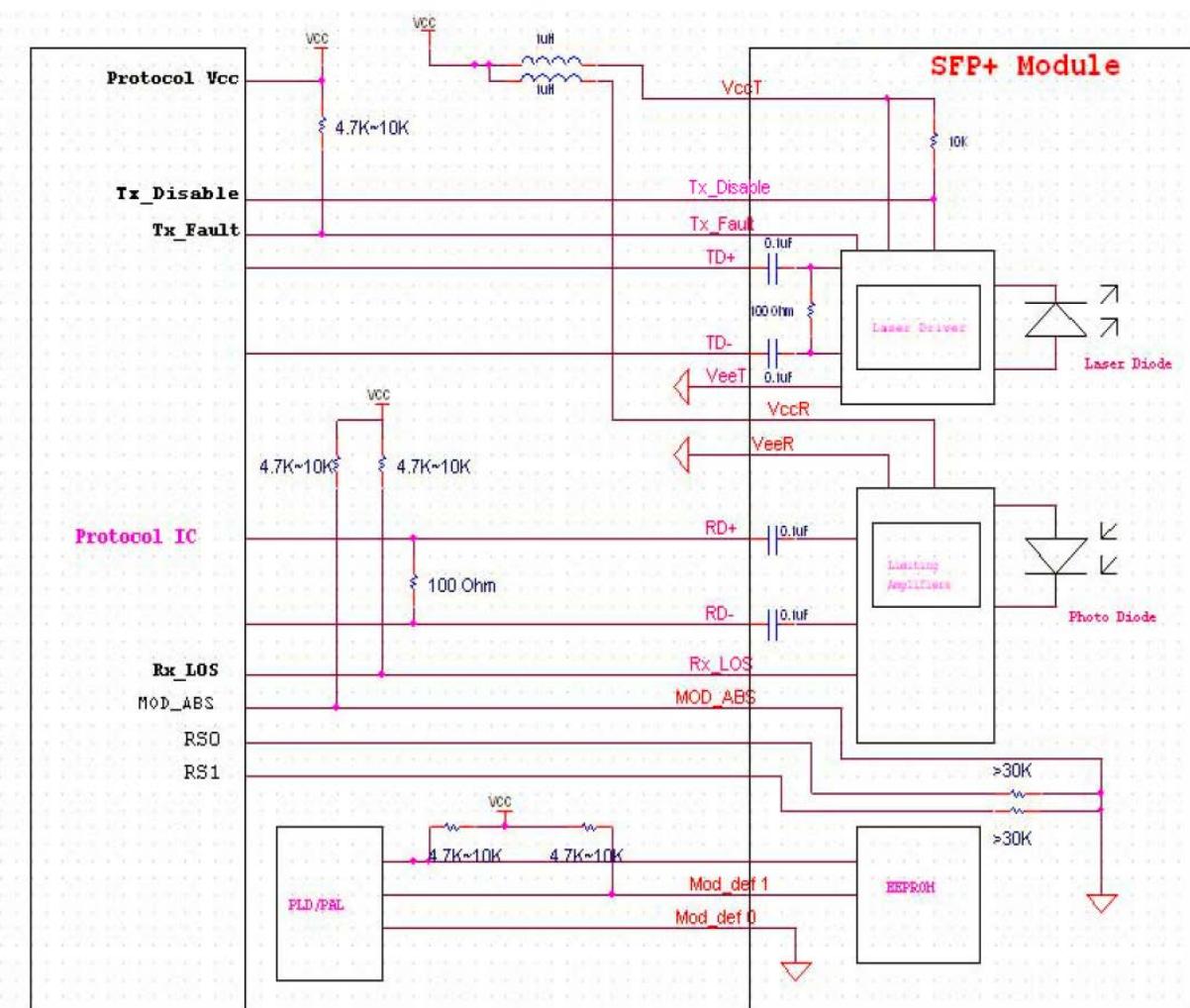
### Notes:

1. Circuit ground is internally isolated from chassis ground.
2.  $T_{FAULT}$  is an open collector/drain output, which should be pulled up with a 4.7 k $\Omega$  to 10 k $\Omega$  resistor on the host board if intended for use. Pull up voltage should be between 2.0 V to Vcc + 0.3 V. A high output indicates a transmitter fault caused by either the TX bias current or the TX output power exceeding the preset alarm thresholds. A low output indicates normal operation. In the low state, the output is pulled to <0.8V.
3. Laser output disabled on  $T_{DIS} > 2.0$  V or open, enabled on  $T_{DIS} < 0.8$  V.
4. Should be pulled up with 4.7 k $\Omega$  to 10 k $\Omega$  host board to a voltage between 2.0 V and 3.6 V. MOD\_ABS pulls line low to indicate module is plugged in.
5. Internally pulled down per SFF-8431 Rev 4.1.
6. LOS is an open collector output. It should be pulled up with 4.7 k $\Omega$  to 10 k $\Omega$  on the host board to a voltage between 2.0 V and 3.6 V. Logic 0 indicates normal operation; logic 1 indicates loss of signal.

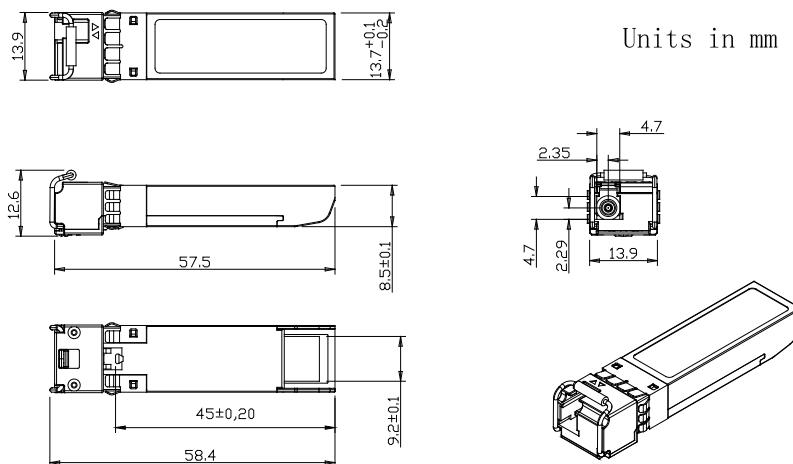
## Regulatory Compliance

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

## Host - Transceiver Interface Block Diagram



## Outline Dimensions



## Digital Diagnostic Functions

ASCENT SFPP-AT-LP-XXXX-10 transceivers support the 2-wire serial communication protocol as defined in the SFP+ MSA.

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 EEPROM 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 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.

## Specifications

### Absolute Maximum Ratings

Parameter	Symbol	Min.	Typ.	Max.	Unit	Notes
Storage Temperature	T <sub>S</sub>	-40	-	85	°C	
Relative Humidity	RH	5	-	95	%	
Power Supply Voltage	V <sub>CC</sub>	-0.3	-	4.0	V	

### Recommended Operating Conditions

Parameter	Symbol	Min.	Typ.	Max.	Unit	Notes
Case Operating Temperature	T <sub>CASE</sub>	0	-	70	°C	Commercial
	T <sub>CASE</sub>	-40	-	85	°C	Industrial
Power Supply Voltage	V <sub>CC</sub>	3.14	3.3	3.47	V	
Power Supply Current	I <sub>CC</sub>	-	-	300	mA	
Data Rate	BR	-	10.3125	11.3	Gbps	
Transmission Distance	TD	-	-	10	km	
Coupled Fiber		Single-mode fiber				9/125 μm SMF

### Optical Characteristics

Parameter	Symbol	Min.	Typ.	Max.	Unit	Notes
<b>Transmitter</b>						
Average Optical Power	P <sub>OUT</sub>	-6	-	-1	dBm	
Average Optical Power (Laser Off)	P <sub>OFF</sub>	-	-	-30	dBm	1
Center Wavelength Range	λ <sub>C</sub>	1260	1270	1280	nm	SFPP-AT-LP-2733-10
		1320	1330	1340		SFPP-AT-LP-3327-10
Side Mode Suppression Ratio	SMSR	30	-	-	dB	
Spectrum Bandwidth (-20 dB)	σ	-	-	1	nm	
Optical Extinction Ratio	ER	3.5	-	-	dB	2
Output Eye Mask		Compliant with IEEE 802.3ae				2
<b>Receiver</b>						
Input Optical Wavelength	λ <sub>IN</sub>	1320	1330	1340	nm	SFPP-AT-LP-2733-10
	λ <sub>IN</sub>	1260	1270	1280	nm	SFPP-AT-LP-3327-10
Receiver Sensitivity	P <sub>SEN</sub>	-	-	-14.4	dBm	3
Input Saturation Power (Overload)	P <sub>SAT</sub>	0.5	-	-	dBm	3
LOS Assert	LOSA	-30	-	-	dBm	
LOS De-assert	LOSD	-	-	-17	dBm	
LOS Detect Hysteresis	P <sub>HYS</sub>	0.5	-	5	dB	

### Notes:

1. The optical power is launched into an SMF

2. Measured with RPBS 2^31-1 test pattern @10.3125Gbs
3. Measured with RPBS 2^31-1 test pattern @10.3125Gbs BER ≤ 10^-12

## Electrical Characteristics

Parameter	Symbol	Min	Typ.	Max	Unit	Notes
Total Power Supply Current	I <sub>CC</sub>	-	-	300	mA	
<b>Transmitter</b>						
Differential Data Input Voltage	V <sub>DT</sub>	180	-	700	mVp-p	
Differential Line Input Impedance	R <sub>IN</sub>	85	100	115	Ω	
Transmitter Fault Output-High	V <sub>FAULTH</sub>	2.4	-	V <sub>CC</sub>	V	
Transmitter Fault Output-Low	V <sub>FAULTL</sub>	-0.3	-	0.8	V	
Transmitter Disable Voltage- High	V <sub>DISH</sub>	2.0	-	V <sub>CC</sub> +0.3	V	
Transmitter Disable Voltage- High	V <sub>DISL</sub>	-0.3	-	0.8	V	
<b>Receiver</b>						
Differential Data Output Voltage	V <sub>DR</sub>	300	-	850	mVp-p	
Differential line Output Impedance	R <sub>OUT</sub>	80	100	120	Ω	
Receiver LOS Pull Up Resistor	R <sub>LOS</sub>	4.7	-	10	kΩ	
Data Output Rise/Fall Time	tr/tf	-	-	38	ps	
LOS Fault	V <sub>LOSSFAULT</sub>	V <sub>CC</sub> - 1.3	-	V <sub>CCHOST</sub>	V	
LOS Normal	V <sub>LOSSNORM</sub>	V <sub>ee</sub>	-	V <sub>ee</sub> +0.8	V	

## Ordering Information

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Model	Description
SFPP-AT-LP-2733-10	SFP+ Plug-in, 10 Gbps, 10 km, TX=1270/RX=1330, single-mode fiber, LC/PC Blue
SFPP-AT-LP-3327-10	SFP+ Plug-in, 10 Gbps, 10 km, TX=1330/RX=1270, single-mode fiber, LC/PC Blue

## Contact Information

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Ver. ACT\_SFPP-AT-LP-XXXX-10\_Datasheet\_V1b\_Aug\_2016