

## 155 Mb/s 1550 nm Single-Mode SFP Transceiver

---

### SFP Series

- Up to 155 Mb/s data links
- DFB laser transmitter and PIN photo-detector
- Up to 80 km on 9/125  $\mu$ 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
- Support Digital Diagnostic Monitoring interface
- Single +3.3V power supply
- Compliant with SFF-8472



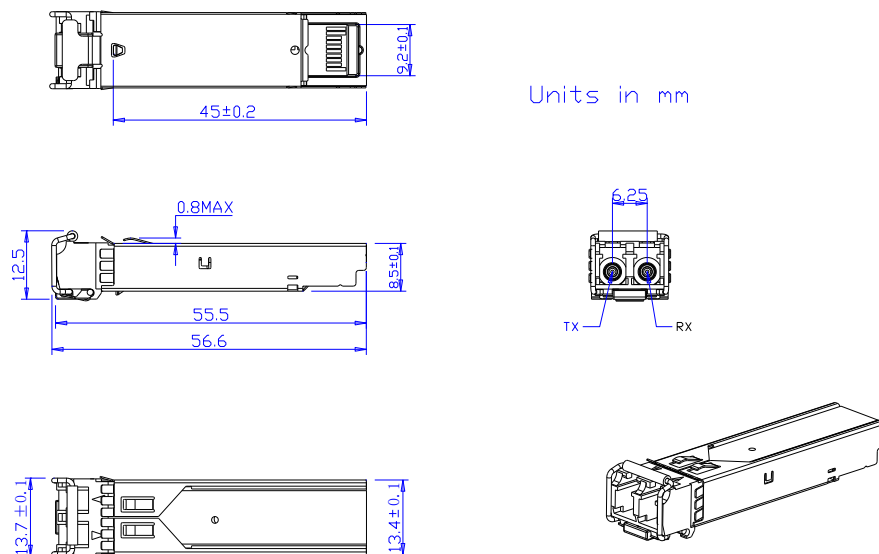
ASCENT's SFP-AF-LP-51-80 Small Form Factor Pluggable (SFP) transceivers are compatible with the Small Form Factor Pluggable Multi-Sourcing Agreement (MSA). The transceiver consists of five sections: the LD driver, the limiting amplifier, the digital diagnostic monitor, the DFB laser and the PIN photo-detector. The module data link up to 80 km in 9/125 $\mu$ m single mode fiber.

The optical output can be disabled by a TTL 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.

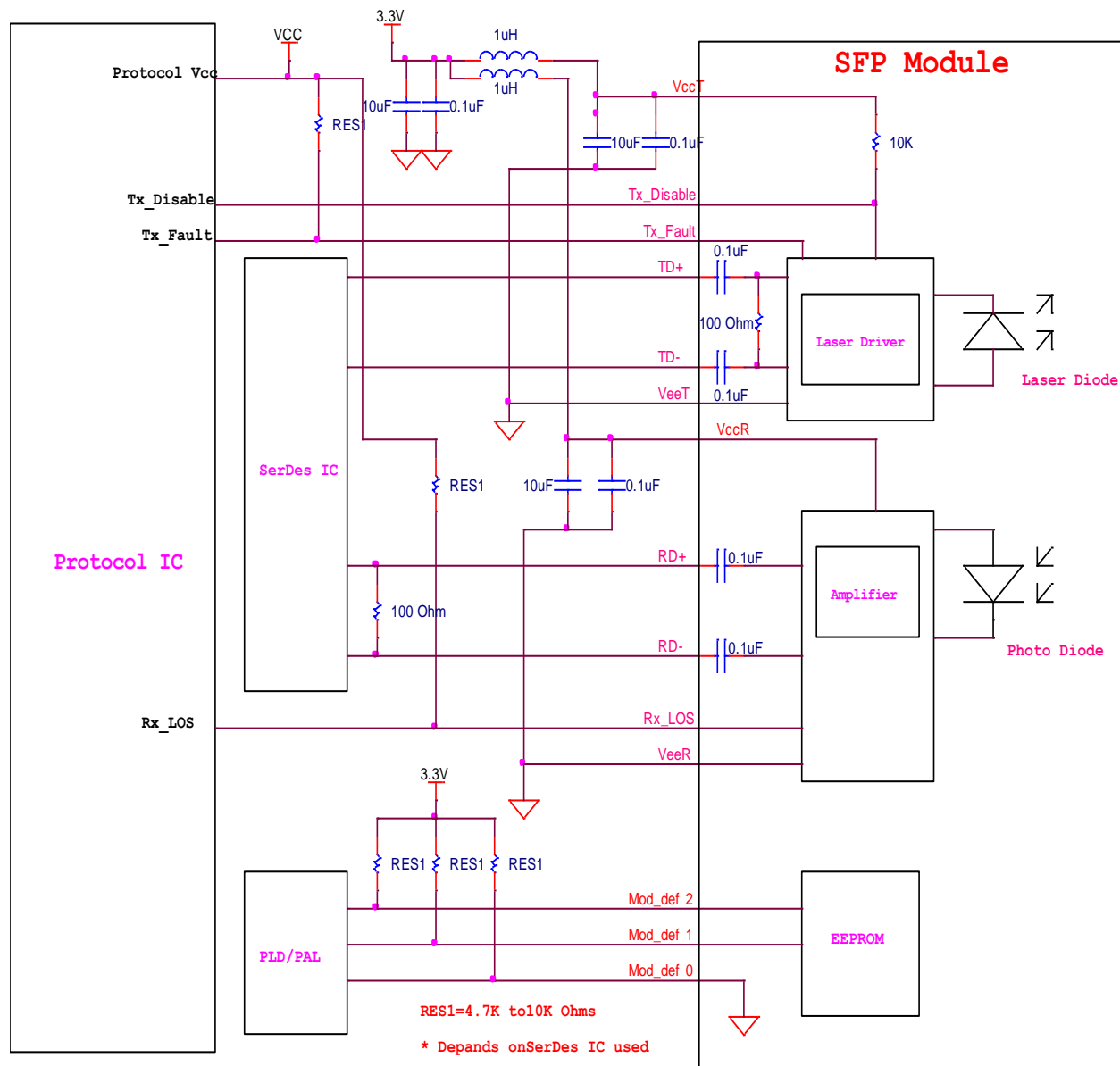
## Key Features

- Up to 155 Mb/s data links
- DFB laser transmitter and PIN photo-detector
- Up to 80 km on 9/125  $\mu$ 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
- Support Digital Diagnostic Monitoring interface
- Single +3.3V power supply
- Compliant with SFF-8472
- Case operating temperature
  - Commercial: 0°C to +70°C
  - Extended: -10°C to +80°C
  - Industrial: -40°C to +85°C

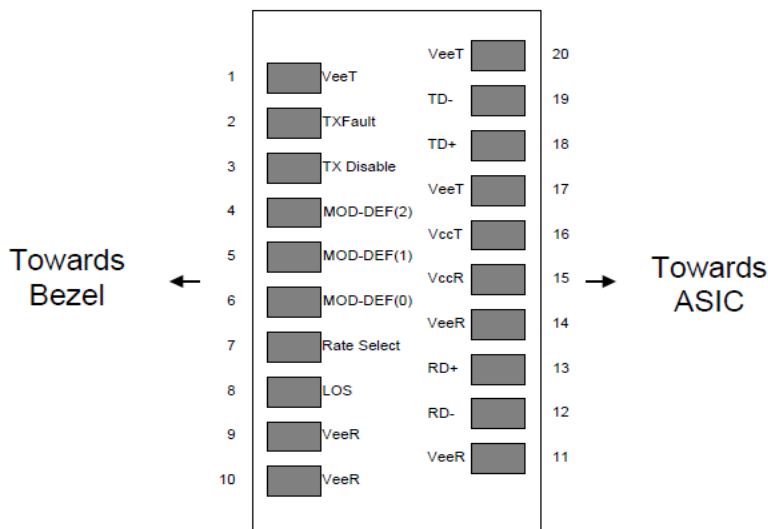
## Outline Diagram



## Host – Transceiver Interface Block Diagram



## Pin Assignment



### Pin-out of Connector Block on Host Board

Pin	Symbol	Name/Description	Note
1	V <sub>EET</sub>	Transmitter Ground (Common with Receiver Ground)	1
2	T <sub>FAULT</sub>	Transmitter Fault. Not supported.	-
3	T <sub>DIS</sub>	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 indicator. Logic 0 indicates normal operation.	5
9	V <sub>EER</sub>	Receiver Ground (Common with Transmitter Ground)	1
10	V <sub>EER</sub>	Receiver Ground (Common with Transmitter Ground)	1
11	V <sub>EER</sub>	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 <sub>EER</sub>	Receiver Ground (Common with Transmitter Ground).	1
15	V <sub>CCR</sub>	Receiver Power Supply	-
16	V <sub>CCT</sub>	Transmitter Power Supply	-
17	V <sub>EET</sub>	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 <sub>EET</sub>	Transmitter Ground (Common with Receiver Ground)	1

### Notes:

1. Circuit ground is internally isolated from chassis ground.
2. Laser output disabled on T<sub>DIS</sub> > 2.0 V or open, enabled on T<sub>DIS</sub> < 0.8 V.

3. Module definition pins should be pulled up with 4.7 kΩ to 10 kΩ resistors 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 >30 kΩ resistor. The input states are:

Low (0 V to 0.8 V):	Reduced Bandwidth
(>0.8 V, <2.0 V):	Undefined
High (2.0 V to 3.465V):	Full Bandwidth
Open:	Reduced Bandwidth

5. The LOS pin is for open collector output. It should be pulled up with a 4.7 kΩ to 10 kΩ resistor 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

## Specifications

### Absolute Maximum Ratings

Item	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

Item	Symbol	Min.	Typ.	Max.	Unit	Note
Case Operating Temperature	Tcase	0		70	°C	Commercial
		-10		80		Extended
		-40		85		Industrial
Power Supply Voltage	Vcc	3.13	3.3	3.47	V	
Power Supply Current	Icc			300	mA	

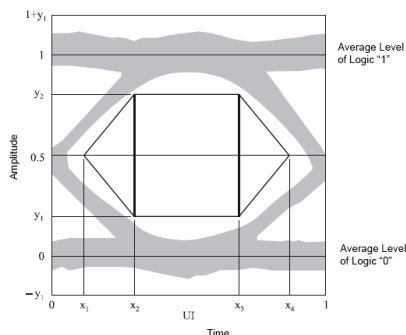
Data Rate	155/155	Mbps	TX Rate/RX Rate
Transmission Distance	80	km	
Coupled Fiber	Single-mode fiber		9/125 $\mu$ m SMF

## Specification of Transmitter

Item	Symbol	Min.	Typ.	Max.	Unit	Note
Average Output Power	$P_{OUT}$	-5		0	dBm	1
Extinction Ratio	ER	8.2			dB	
Center Wavelength	$\lambda_C$	1530	1550	1570	nm	FP Laser
Side Mode Suppression Ratio	SMSR	30			dB	
Spectrum Bandwidth (-20 dB)	$\sigma$			1	nm	
Transmitter OFF Output Power	$P_{OFF}$			-45	dBm	
Differential Line Input Impedance	RIN	90	100	110	$\Omega$	
Output Eye Mask	Compliant with IEEE802.3 z (class 1 laser safety)					2

### Notes:

1. Measure at  $2^{23}-1$  NRZ PRBS pattern.
2. Transmitter eye mask definition



	STM-1	STM-4
$x_1/x_4$	0.15/0.85	0.25/0.75
$x_2/x_3$	0.35/0.65	0.40/0.60
$y_1/y_2$	0.20/0.80	0.20/0.80

## Specification of Receiver

Item	Symbol	Min.	Typ.	Max.	Unit	Notes
Input Optical Wavelength	$\lambda_{IN}$	1270		1610	nm	
Receiver Sensitivity	$P_{IN}$			-33	dBm	1
Input Saturation Power (Overload)	$P_{SAT}$	-3			dBm	
LOS De-assert	LOSD			-34	dBm	
LOS Assert	LOSA	-45			dBm	2
LOS Hysteresis		0.5	2	6	dB	

### Notes:

1. Measured with Light source 1550 nm, ER = 8.2 dB; BER =  $<10^{-12}$  @ PRBS= $2^{23}-1$  NRZ.
2. When LOS de-asserted, the RX data  $\pm$  output is high-level (fixed).

## Electrical Interface Characteristics

Item	Symbol	Min.	Typ.	Max.	Unit	Notes
<b>Transmitter</b>						
Total Supply Current	ICC			A	mA	1
Transmitter Disable Input-High	VDISH	2		V <sub>cc</sub> +0.3	V	
Transmitter Disable Input-Low	VDISL	0		0.8	V	
Transmitter Fault Input-High	VTxFH	2		V <sub>cc</sub> +0.3	V	
Transmitter Fault Input-Low	VTxFL	0		0.8	V	
<b>Receiver</b>						
Total Supply Current	ICC			B	mA	1
LOSS Output Voltage-High	VLOSH	2		V <sub>cc</sub> +0.3	V	LVTTL
LOSS Output Voltage-Low	VLOSL	0		0.8	V	

### Notes:

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

## Digital Diagnostic Functions

ASCENT SFP-AF-LP-51-80 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-AF-LP-51-80 are internally calibrated by default.

## Ordering Information

Product Name	Product Description
SFP-AF-LP-51-80	SFP Plug-in, 155Mbps, 80km, TX=1550/RX wide, on two single mode fibers, LC/PC Blue

## Contact Information



### Ascent Communication Technology Ltd

#### AUSTRALIA

140 William Street, Melbourne  
Victoria 3000, AUSTRALIA  
Phone: +61-3-8691 2902

#### CHINA

Unit 1933, 600 Luban Road  
200023, Shanghai CHINA  
Phone: +86-21-60232616

#### EUROPE

Pfarrer-Bensheimer-Strasse 7a  
55129 Mainz, GERMANY  
Phone: +49 (0) 6136 926 3246

#### HONG KONG SAR

Unit 9, 12<sup>th</sup> Floor, Wing Tuck Commercial Centre  
177 Wing Lok Street, Sheung Wan, HONG KONG  
Phone: +852-2851 4722

#### USA

2710 Thomes Ave  
Cheyenne, WY 82001, USA  
Phone: +1-203 816 5188

#### VIETNAM

15 /F TTC Building, Duy Tan Street  
Cau Giay Dist., Hanoi, VIETNAM  
Phone: +84 243 795 5917

**WEB:** [www.ascentcomtec.com](http://www.ascentcomtec.com)

**EMAIL:** [sales@ascentcomtec.com](mailto:sales@ascentcomtec.com)

Specifications and product availability are subject to change without notice.  
Copyright © 2019 Ascent Communication Technology Limited. All rights reserved.  
Ver. ACT\_SFP-AF-LP-51-80\_Datasheet\_V1b\_Aug\_2019