

1.25 Gb/s SFP 1550nm 160km Transceiver

SFP Series



- **Operating Data Rate up to 1.25Gbps**
- **1550nm DFB Laser Transmitter**
- **160km with 9/125 μ m SMF**
- **Single 3.3V Power Supply**
- **Hot-Pluggable SFP Footprint Duplex LC Connector Interface**
- **Class 1 FDA and IEC60825-1 Laser Safety Compliant**
- **Support Commercial and Industrial Temperature**
- **Compliant with MSA SFP Specification**
- **Compliant with SFF-8472**
- **ROHS 2.0 compatible**

ASCENT's SFP-AG-LP-51-160 Small Form Factor Pluggable (SFP) transceivers are flexible solution as an interface for switches, routers, servers, and other optical links. They are compatible with the Small Form Factor Pluggable Multi-Sourcing Agreement (MSA).

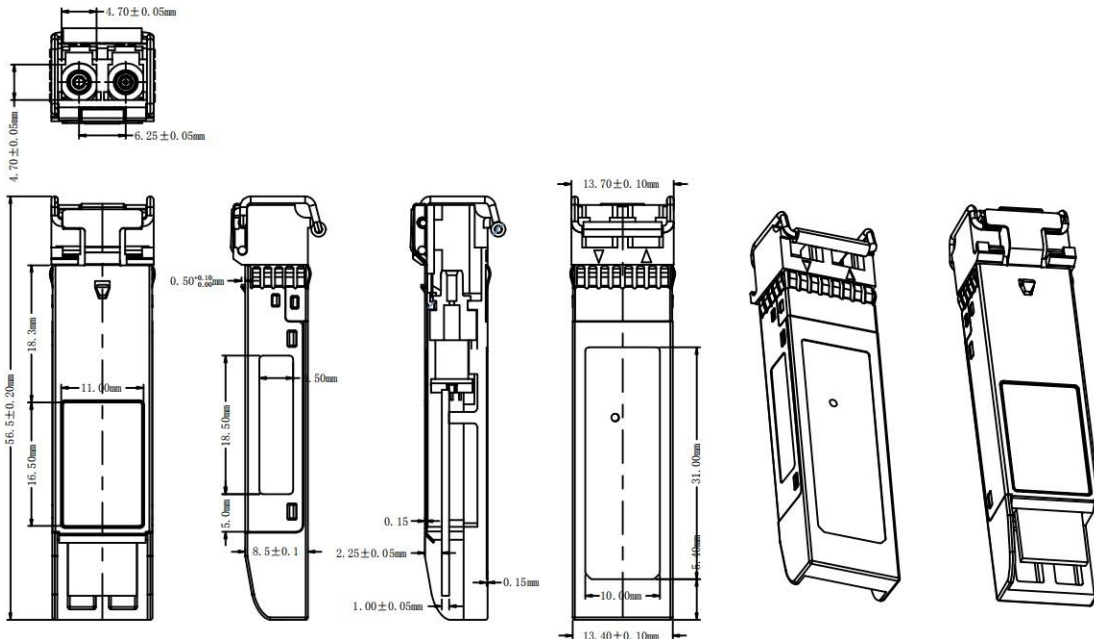
The transceiver consists of five sections: the LD driver, the limiting amplifier, the digital diagnostic monitor, the DFB laser and the PIN photo-detector. The module data link up to 160 km in 9/125 μ m single mode fiber.

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.

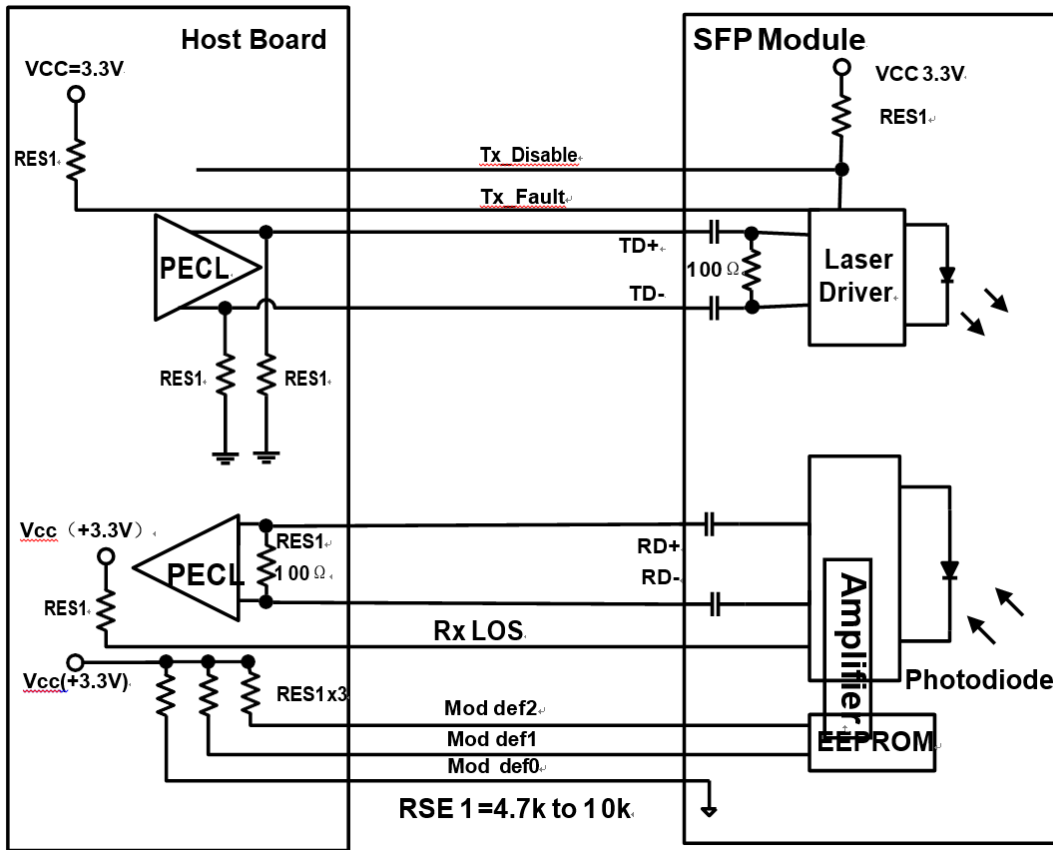
Key Features

- Operating Data Rate up to 1.25Gbps
- 1550nm DFB Laser Transmitter
- 160km with 9/125 μm SMF
- Single 3.3V Power Supply
- Hot-Pluggable SFP Footprint Duplex LC Connector Interface
- Class 1 FDA and IEC60825-1 Laser Safety Compliant
- Operating Temperature: Standard: 0°C to +70°C, Industrial: -40°C to +85°C
- Applications: Gigabit Ethernet Switches and Routers, Fiber Channel Switch Infrastructure, STM-4 and other optical links
- Compliant with MSA SFP Specification
- Compliant with SFF-8472
- ROHS 2.0 compatible

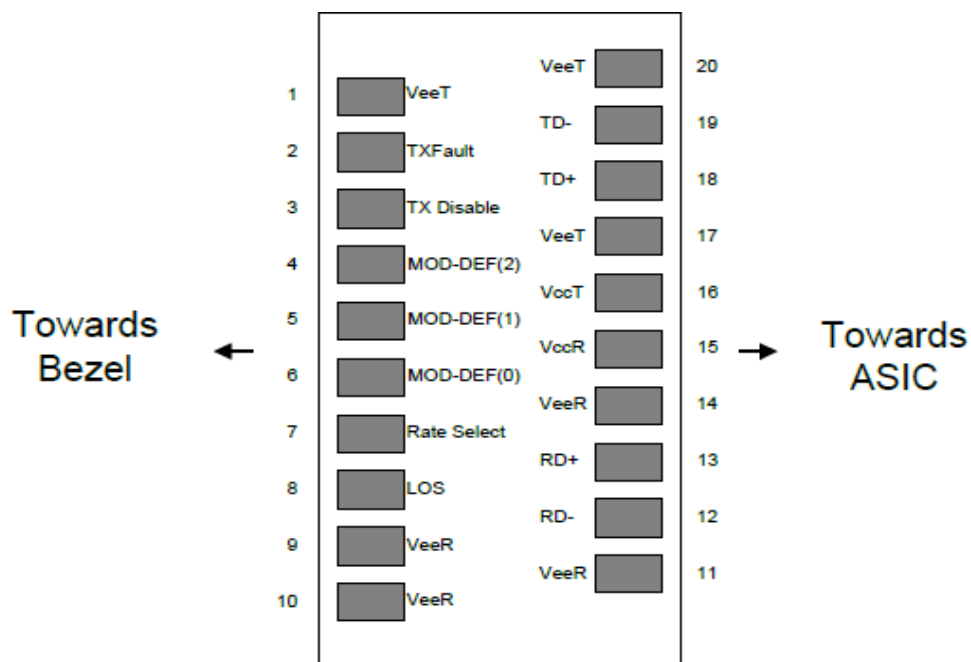
Mechanical Dimensions



Recommend Circuit Schematic



Pin Map and Description



Pin	Name	Function	Plug Seq.	Notes
1	VeeT	Transmitter Ground	1	5)
2	TX Fault	Transmitter Fault Indication	3	1)
3	TX Disable	Transmitter Disable	3	2) Module disables on high or open
4	MOD-DEF2	Module Definition 2	3	3) 2 wire serial ID interface.
5	MOD-DEF1	Module Definition 1	3	3) 2 wire serial ID interface.
6	MOD-DEF0	Module Definition 0	3	3) Grounded within the module.
7	Rate Select	Not Connect	3	Function not available
8	LOS	Loss of Signal	3	4)
9	VeeR	Receiver Ground	1	5)
10	VeeR	Receiver Ground	1	5)
11	VeeR	Receiver Ground	1	5)
12	RD-	Inv. Received Data Out	3	6)
13	RD+	Received Data Out	3	7)
14	VeeR	Receiver Ground	1	5)
15	VccR	Receiver Power	2	7) $3.3 \pm 5\%$
16	VccT	Transmitter Power	2	7) $3.3 \pm 5\%$
17	VeeT	Transmitter Ground	1	5)
18	TD+	Transmit Data In	3	8)
19	TD-	Inv. Transmit Data In	3	8)
20	VeeT	Transmitter Ground	1	5)

NOTES:

- TX Fault is an open collector/drain output, which should be pulled up with a 4.7 – 10KΩ resistor on the host board. Pull up voltage between 2.0V and $V_{ccT}/R+0.3V$. When high, output indicates a laser fault of some kind. Low indicates normal operation. In the low state, the output will be pulled to < 0.8V.
- TX disable is an input that is used to shut down the transmitter optical output. It is pulled up within the module with a 4.7 – 10KΩ resistor. Its states are:
 - Low (0 – 0.8V): Transmitter on
 - (>0.8, < 2.0V): Undefined
 - High (2.0 – 3.465V): Transmitter Disabled
 - Open: Transmitter Disabled
- Mod-Def 0, 1, 2. These are the module definition pins. They should be pulled up with a 4.7 – 10KΩ resistor on the host board. The pull-up voltage shall be V_{ccT} or V_{ccR} .
 - 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.
- LOS (Loss of Signal) is an open collector/drain output, which should be pulled up with a 4.7 – 10KΩ resistor. Pull up voltage between 2.0V and $V_{ccT}/R+0.3V$. When high, this output indicates the received optical power is below the worst-case receiver sensitivity (as defined by the standard in use). Low indicates normal operation. In the low state, the output will be pulled to < 0.8V.
- VeeR and VeeT may be internally connected within the SFP module.
- RD-/+ : These are the differential receiver outputs. They are AC coupled 100Ω differential Lines

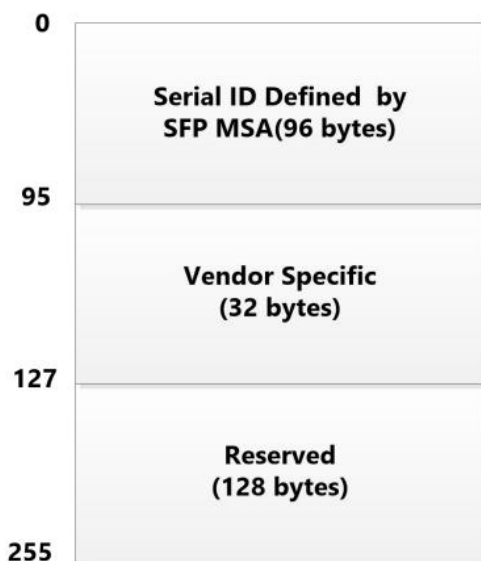
which should be terminated with 100Ω (differential) at the user SERDES. The AC coupling is done inside the module and is thus not required on the host board. The voltage swing on these lines will be between 400 and 2000mV differential (200 – 1000mV single ended) when properly terminated.

7. VccR and VccT are the receiver and transmitter power supplies. They are defined as 3.3V±5% at the SFP connector pin. Maximum supply current is 300mA. Recommended host board power supply filtering is shown below. Inductors with DC resistance of less than 1 ohm should be used in order to maintain the required voltage at the SFP input pin with 3.3V supply voltage. When the recommended supply-filtering network is used, hot plugging of the SFP transceiver module will result in an inrush current of no more than 30mA greater than the steady state value. VccR and VccT may be internally connected within the SFP transceiver module.
8. TD-/+ : These are the differential transmitter inputs. They are AC-coupled, differential lines with 100 differential terminations inside the module. The AC coupling is done inside the module and is thus not required on the host board. The inputs will accept differential swings of 400 – 2000mV (200 – 1000mV single-ended).

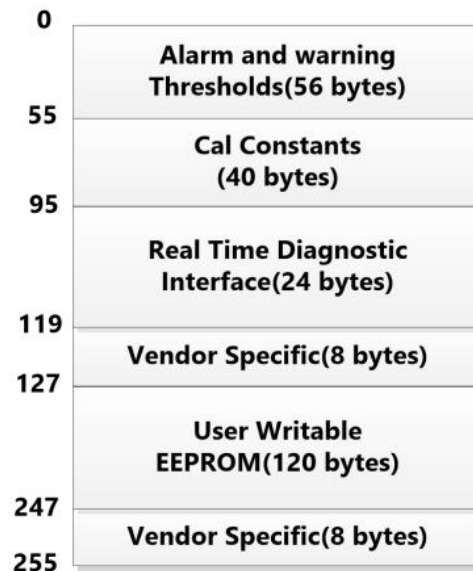
EEPROM

The serial interface uses the 2-wire serial CMOS EEPROM protocol defined. When the serial protocol is activated, the host generates the serial clock signal (SCL). The positive edge clocks data into those segments of the EEPROM that are not write protected within the SFP transceiver. The negative edge clocks data from the SFP transceiver. The serial data signal (SDA) 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. The Module provides diagnostic information about the present operating conditions. The transceiver generates this diagnostic data by digitization of internal analog signals. Calibration and alarm/warning threshold data is written during device manufacture. Received power monitoring, transmitted power monitoring, bias current monitoring, supply voltage monitoring and temperature monitoring all are implemented. If the module is defined as external calibrated, the diagnostic data are raw A/D values and must be converted to real world units using calibration constants stored in EEPROM locations 56 – 95 at wire serial bus address A2h. The digital diagnostic memory map specific data field define as following. For detail EEPROM information please refer to the related document of SFF8472 Rev 10.2.

2 wire address 1010000X(A0h)



2 wire address 1010000X (A2h)



Specifications

Absolute Maximum Ratings

Parameter	Symbol	Min.	Max.	Unit
Storage Temperature	T _s	-40	+85	°C
Maximum Supply Voltage	V _{cc}	-0.5	3.6	V
Operating Relative Humidity	RH		95	%

Notes:

- Exceeding any one of these values may destroy the device immediately.

Recommended Operating Conditions

Parameter	Symbol	Min.	Typ.	Max.	Unit	Note
Operating Case Temperature	T _c	0		+70	°C	SFP-AG-LP-51-160
		-40		+85	°C	SFP-AGLP-51-160A
Power Supply Voltage	V _{cc}	3.15	3.3	3.45	V	
Power Supply Current	I _{cc}			300	mA	
Data Rate	GBE		1.25		Gbps	
			FC	1.063		

Electrical Characteristics

Parameter	Symbol	Min.	Typ.	Max.	Unit	Note
Transmitter						
LVPECL Inputs (Differential)	V _{in}	500		2400	mVpp	AC Coupled Inputs ^{*(Note1)}
Input Impedance (Differential)	Z _{in}	85	100	115	ohms	R _{in} > 100 kohms @ DC
TX_Dis	Disable	2		V _{cc}	V	
	Enable	0		0.8		
TX_FAULT	Fault	2		V _{cc} +0.3	V	
	Normal	0		0.5		
Receiver						
LVPECL Outputs (Differential)	V _{out}	370		2000	mVpp	AC Coupled Outputs ^{*(Note1)}
Output Impedance (Differential)	Z _{out}	85	100	115	ohms	
TX_Disable Assert Time	t _{off}			10	us	
RX_LOS	LOS	2		V _{cc} +0.3	V	
	Normal	0		0.8		
MOD_DEF (0.2)	VoH	2.5			V	With Serial ID
	VoL	0		0.5		

Notes:

- LVPECL logic, internally AC coupled.

Optical Characteristics

Parameter	Symbol	Min.	Typ.	Max.	Unit
9µm Core Diameter SMF	L		160		km
Data Rate			1.063/1.25		Gbps
Transmitter					
Center Wavelength	λ_c	1500	1550	1580	nm
Spectral Width (-20dB)	$\Delta\lambda$			1	nm
Side Mode Suppression Ratio	SMSR	30			dB
Average Output Power* (Note1)	Pout	+3		+7	dBm
Extinction Ratio*(Note2)	ER	9			dB
Rise/Fall Time (20% to 80%)	tr/tf			0.26	ns
Total Jitter*(Note2)	TJ			0.43	UI
Output Optical Eye	Compliant with IEEE 802.3				
Pout@TX Disable Asserted	Pout			-45	dBm
Receiver					
Center Wavelength	λ_c	1260		1600	nm
Receiver Sensitivity*(Note3)	Pmin			-34	dBm
Receiver Overload	Pmax	-10			dBm
LOS De-Assert	LOSD			-38	dBm
LOS Assert	LOSA	-45			dBm
LOS Hysteresis		0.5			dB

Notes:

1. Output power is measured by coupling into a 9/125 mm multi-mode fiber.
2. Filtered, measured with a PRBS 2⁷-1 test pattern @1250Mbps.
3. Minimum average optical power is measured at BER less than 1E-12, with 2⁷-1 PRBS and ER=9 dB

Digital Diagnostic Functions

Parameter	Range	Unit	Accuracy	Calibration
Temperature	-40 to 85	°C	±3°C	Internal / External
Voltage	3.0 to 3.6	V	±3%	Internal / External
Bias Current	10 to 80	mA	±10%	Internal / External
TX Power	3 to 7	dBm	±3dB	Internal / External
RX Power	-34 to -10	dBm	±3dB	Internal / External

Ordering Information

Product Name	Product Description
SFP-AG-LP-51-160	SFP Plug-in, 1Gbps, 160km, TX=1550/RX wide, on two single mode fibers, LC/PC Blue, with DDM, Commercial Temp
SFP-AGLP-51-160A	SFP Plug-in, 1Gbps, 160km, TX=1550/RX wide, on two single mode fibers, LC/PC Blue, with DDM, Industrial Temp

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, 12th Floor, Wing Tuck Commercial Centre
177 Wing Lok Street, Sheung Wan, Hong Kong
SAR

Phone: +852-2851 4722

USA

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

VIETNAM

11th Floor, Hoa Binh Office Tower
106 Hoang Quoc Viet Street, Nghia Do Ward
Cau Giay District, Hanoi 10649, VIETNAM
Phone: +84-24-37955917

WEB: www.ascentcomtec.com

EMAIL: sales@ascentcomtec.com

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