1.25 Gbps 1550 nm Single-mode SFP Transceiver

- Up to 1.25 Gbps data links
- DFB laser transmitter and PIN photo-detector
- Up to 40 km on 9/125 µm SMF
- Duplex LC/UPC type pluggable optical interface
- Switch to Switch interface
- Gigabit Ethernet
- Switched backplane applications
- Router/server interface
- Other optical links

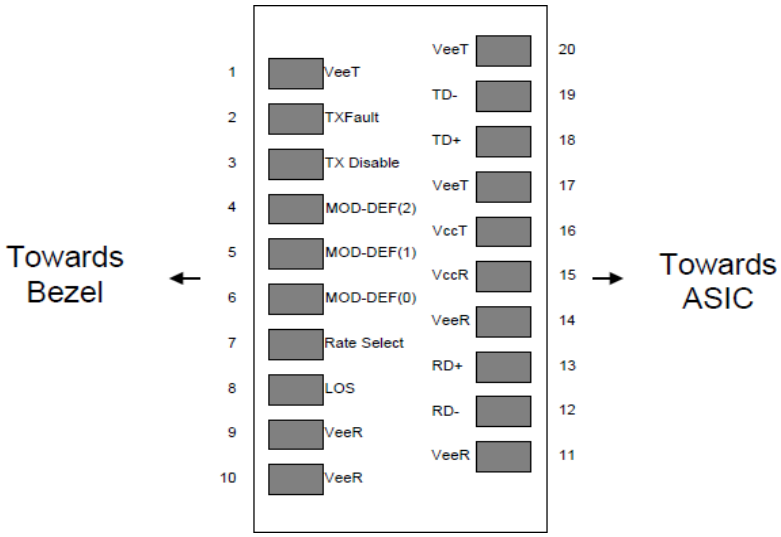
ASCENT's SFP-AG-LP-51-40 Small Form Factor Pluggable (SFP) transceivers are compatible with the Small Form Factor Pluggable Multi-Sourcing Agreement (MSA). The transceiver consists of five sections: the LD driver, the limiting amplifier, the digital diagnostic monitor, the DFB laser and the PIN photo-detector .The module data link is capable of distances up to 40 km on 9/125 µm 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 1.25 Gbps data links
- DFB laser transmitter and PIN photo-detector
- Up to 40km 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 +3.3 V power supply
- Supports Digital Diagnostic Monitoring interface
- Compliant with SFF-8472

Pin Assignment



Pin out of Connector Block on Host Board

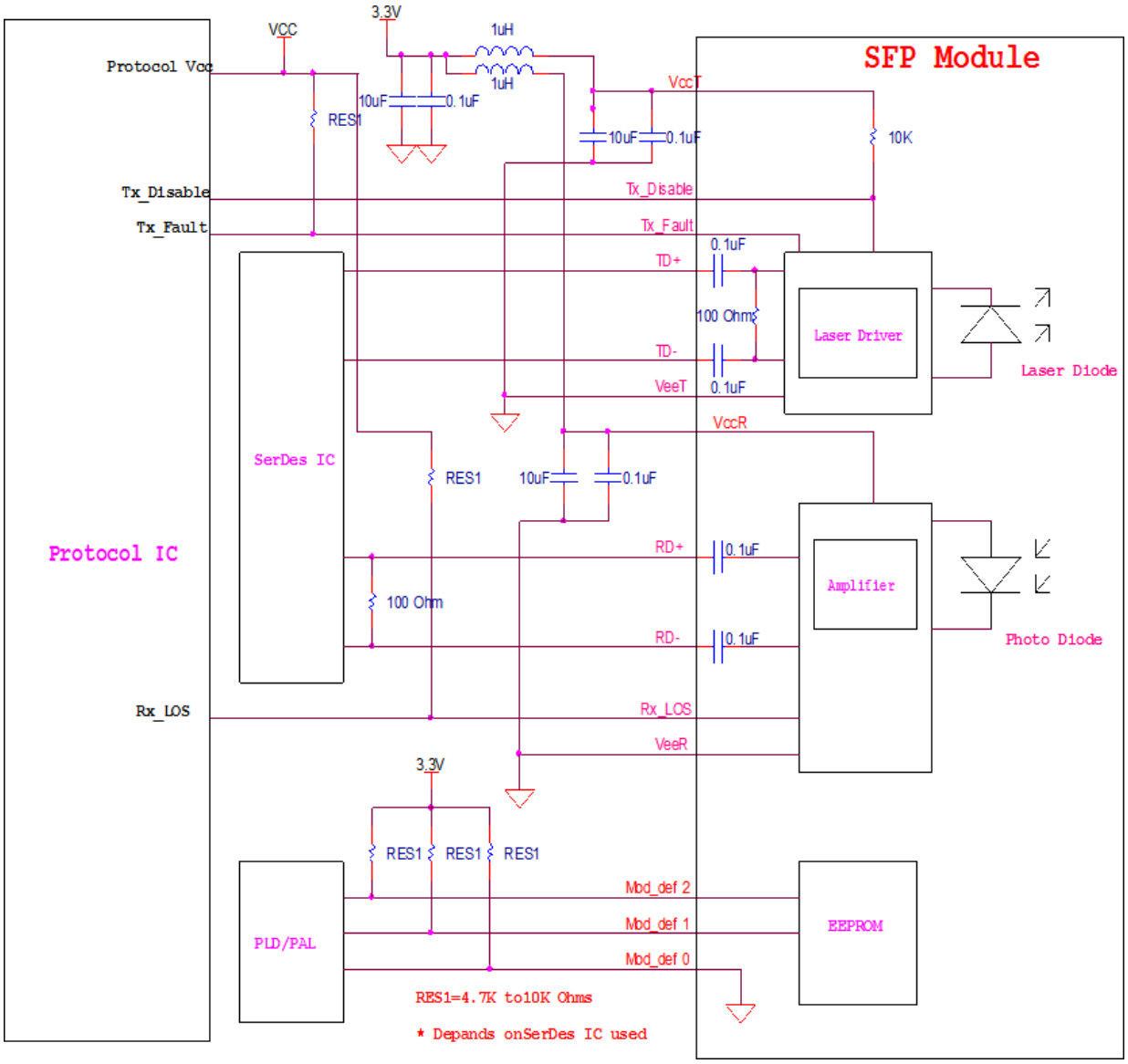
Pin	Symbol	Name/Description	NOTE
1	V_{EET}	Transmitter Ground (Common with Receiver Ground)	1
2	T_{FAULT}	Transmitter Fault	
3	T_{DIS}	Transmitter Disable. Laser output disabled on high or open	2
4	MOD_DEF(2)	Module Definition 2. Data line for Serial ID	3

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 TDIS > 2.0V or open, enabled on TDIS <0.8V.
3. Should be pulled up with 4.7 kΩ to 10 kΩ on host board to a voltage between 2.0 V and 3.6 V. 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 to 0.8 V): Reduced Bandwidth
   - (>0.8, <2.0 V): Undefined
   - High (2.0 V to 3.465 V): Full Bandwidth
   - Open: Reduced Bandwidth
5. LOS is open collector output should be pulled up with 4.7 kΩ to 10 kΩ on host board to a voltage between 2.0 V and 3.6 V. Logic 0 indicates normal operation; logic 1 indicates loss of signal.

Host - Transceiver Interface Block Diagram



Digital Diagnostic Functions

Ascent SFP-AG-LP-51-40 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-51-40 are internally calibrated by default.

Specifications

Absolute Maximum Ratings

Parameter	Symbol	Min.	Typ.	Max.	Unit	Notes
Storage Temperature	Ts	-40		85	°C	
Relative Humidity	RH	5		95	%	
Power Supply Voltage	Vcc	-0.5		4.0	V	
Signal Input Voltage		-0.3		Vcc+0.3	V	
Receiver Damage Threshold		+5			dBm	

Recommended Operating Conditions

Parameter	Symbol	Min.	Typ.	Max.	Unit	Notes
Case Operating Temperature	T_{case}	-0		70	°C	
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	
Data Rate	BR		1250/1250		Gbps	TX rate/RX rate
Transmission Distance	TD			40	km	
Coupled Fiber	Single-mode fiber					9/125 µm SMF

Transmitter Specifications

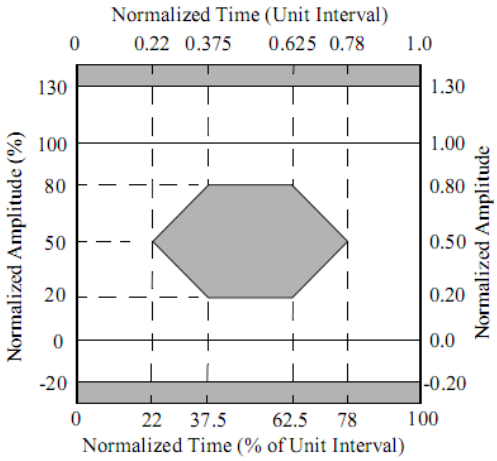
Parameter	Symbol	Min.	Typ.	Max.	Unit	Note
Average Output Power	P_{OUT}	-5		0	dBm	Note (1)
Extinction Ratio	ER	9			dB	
Center Wavelength	λ_C	1530	1550	1570	nm	DFB Laser
Side Mode Suppression Ratio	SMSR	30			dB	

Spectrum Bandwidth (-20 dB)	σ			1	nm	
Transmitter OFF Output Power	P_{OFF}			-45	dBm	
Differential Line Input Impedance	RIN	90	100	110	Ω	
Output Eye Mask	Compliant with IEEE802.3 z (class 1 laser safety)					Note (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}			-24	dBm	Note (1)
Input Saturation Power (Overload)	P_{SAT}	-1			dBm	
LOS De-assert	LOSD			-25	dBm	
LOS Assert	LOSA	-38			dBm	Note (2)
LOS Hysteresis		0.5	2	6	dB	

Note:

1. Measured with Light source 1550nm, ER=9dB; BER =<10^-12 @PRBS=2^7-1 NRZ.

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

Electrical Interface Characteristics

Parameter	Symbol	Min.	Typ.	Max.	Unit	Note
Transmitter						
Total Supply Current	I_{CC}			A	mA	Note (1)
Transmitter Disable Input-High	V_{DISH}	2		Vcc+0.3	V	
Transmitter Disable Input-Low	V_{DISL}	0		0.8	V	
Transmitter Fault Input-High	V_{TxFH}	2		Vcc+0.3	V	
Transmitter Fault Input-Low	V_{TxFL}	0		0.8	V	

Receiver					
Total Supply Current	I_{CC}		B	mA	Note (1)
LOSS Output Voltage-High	V_{LOSH}	2	Vcc+0.3	V	LVTTL
LOSS Output Voltage-Low	V_{LOSL}	0	0.8	V	

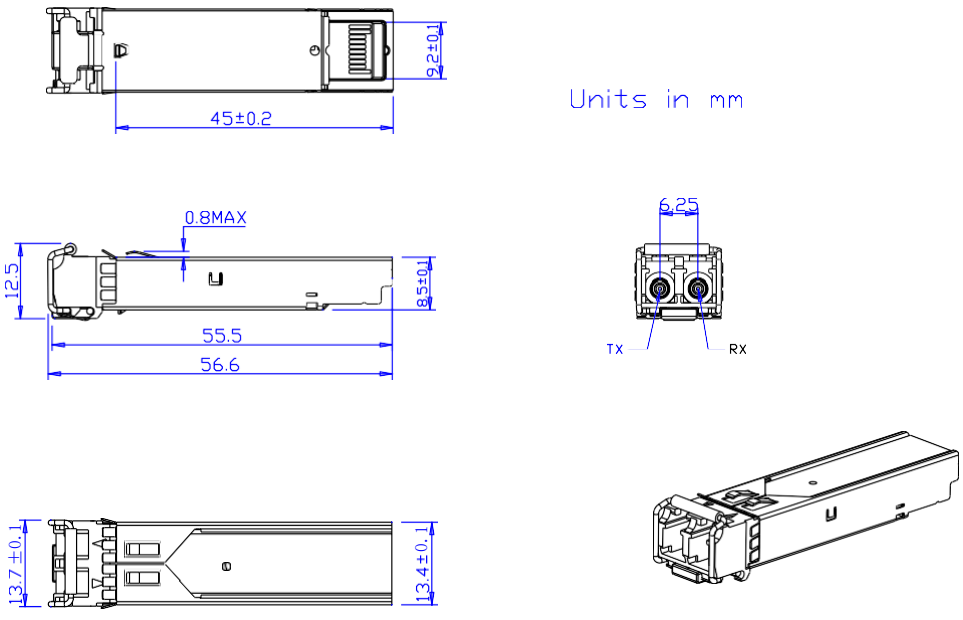
Note:

1. A (TX) + B (RX) = 280 mA (Not including 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 550222 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

Outline Dimensions



Ordering Information

Item	Description
SFP-AG-LP-51-40	SFP Plug-in, 1Gbps, 40 km, TX=1550/RX wide, on two single mode fibers, LC/PC Blue

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