ASCENT ☀ Communication Technology

10 Gb/s 1550nm SFP+ 40 km Transceiver

SFP+ Series

- **Support data rate up to 11.3 Gb/s**

- **Compliant with 10GBASE-ER/EW**

- **Hot-Pluggable SFP Footprint and Duplex LC Connector**

- **Up to 40km reach for G.652 SMF**

- **Support Commercial and Industrial Temperature**

- **Compliant with SFP-8431, SFP-8432, SFP-8472 and IEEE802.3ae**

ASCENT's SFP+ transceiver SFPP-ATLP-51-40 is designed for use in 10-Gigabit Ethernet links up to 40km over single mode fiber.

The module consists of 1550 EML Laser, InGaAs PIN and Preamplifier in a high-integrated optical sub-assembly.

Digital diagnostics functions are available via a 2-wire serial interface, as specified in SFF¬8472. The module data link up to 40km in 9/125um single mode fiber.

The 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.
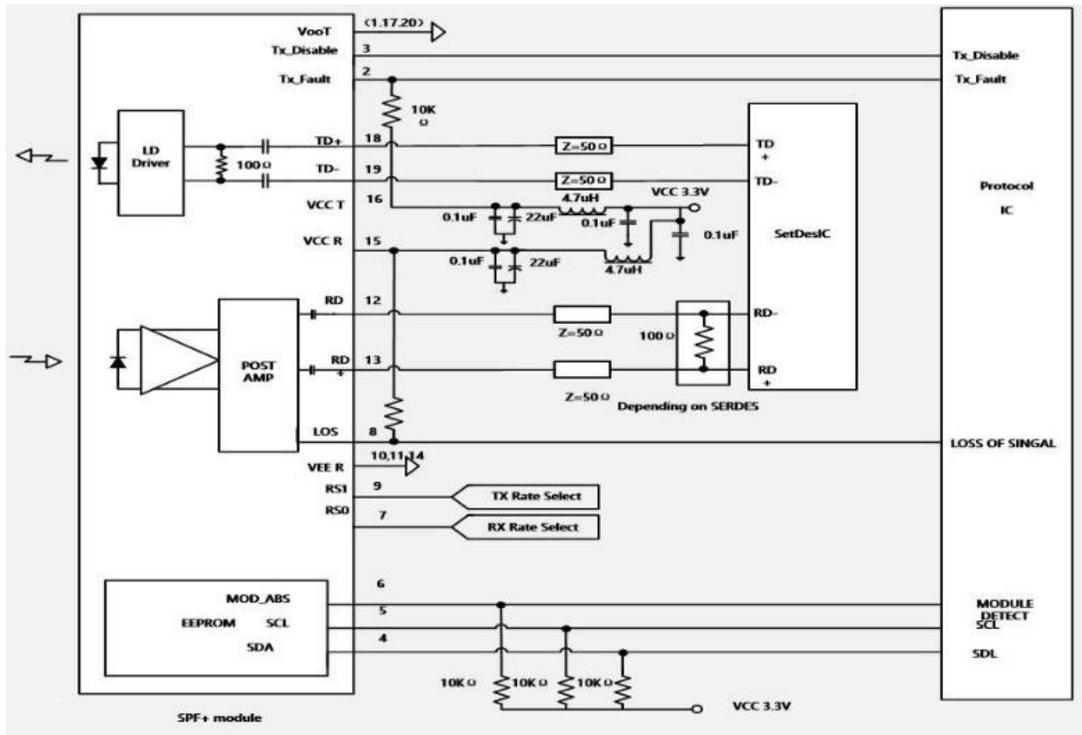
Key Features

- Support data rate up to 11.3Gb/s

- Compliant with 10GBASE-ER/EW

- Hot-Pluggable SFP Footprint and Duplex LC Connector

- Up to 40km reach for G.652 SMF

- Temperature Range:

  Commercial: 0°C to +70°C

  Industrial: -40°C to +85°C

- Compliant with SFP-8431

- Compliant with SFP-8432

- Compliant with SFP-8472

- Compliant with IEEE802.3ae

Outline Diagram
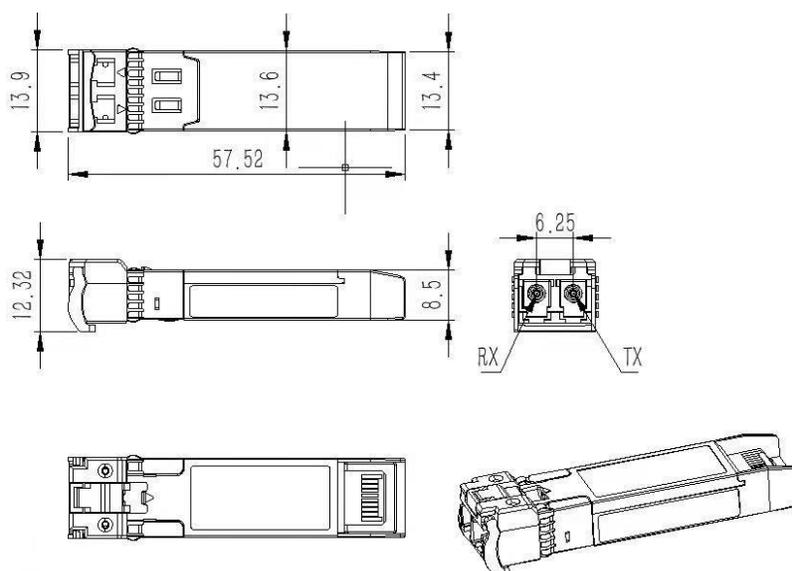
Recommend Circuit Schematic

Digital Diagnostic Functions

Parameter	Range	Unit	Accuracy	Calibration
Commercial Temperature	0 to +70	°C	±3°C	Internal / External
Industrial Temperature	-40 to +85	°C	±3°C	Internal / External
Voltage	3.0 to 3.6	V	±3%	Internal / External
Bias Current	30 to 100	mA	±10%	Internal / External
TX Power	0 to +4	dBm	±3dB	Internal / External
RX Power	-23 to -6	dBm	±3dB	Internal / External

Pin Assignment
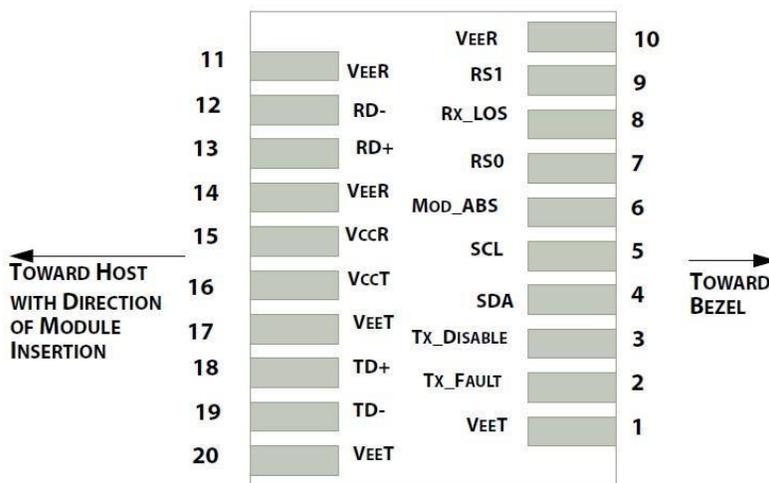
Pin #	Name	Function	Notes
1	VeeT	Module transmitter ground	1
2	Tx Fault	Module transmitter fault	2
3	Tx Disable	Transmitter Disable; Turns off transmitter laser output	3
4	SDL	2 wire serial interface data input/output (SDA)	4
5	SCL	2 wire serial interface clock input (SCL)	4
6	MOD-ABS	Module Absent, connect to VeeR or VeeT in the module	4
7	RS0	Rate select0, optionally control SFP+ receiver. When high, input data rate >4.5Gb/ s; when low, input data rate <=4.5Gb/s	5
8	LOS	Receiver Loss of Signal Indication	6
9	RS1	Rate select0, optionally control SFP+ transmitter. When high, input data rate >4.5Gb/s; when low, input data rate <=4.5Gb/s	1
10	VeeR	Module receiver ground	1
11	VeeR	Module receiver ground	1
12	RD-	Receiver inverted data out put	
13	RD+	Receiver non-inverted data out put	
14	VeeR	Module receiver ground	1
15	VccR	Module receiver 3.3V supply	
16	VccT	Module transmitter 3.3V supply	
17	VeeT	Module transmitter ground	1
18	TD+	Transmitter inverted data out put	
19	TD-	Transmitter non-inverted data out put	
20	VeeT	Module transmitter ground	1

Note:

1. Circuit ground is internally isolated from chassis ground

2. Tx FAULT is an open collector/drain output, which should be pulled up with a 4.7k to 10k Ohms resistor on the host board if intended for use. Pull up voltage should be between 2.0V to Vcc + 0.3V. 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 Tx DIS >2.0V or open, enabled on Tx DIS <0.8V.

4. Should be pulled up with 4.7kΩ- 10kΩ host board to a voltage between 2.0V and 3.6V. MOD_ABS
   pulls line low to indicate module is plugged in.

5. Internally pulled down per SFF-8431 Rev 4.1.

6. LOS is open collector output. It should be pulled up with 4.7kΩ to 10kΩ on host board to a voltage
   between 2.0V and 3.6V. Logic 0 indicates normal operation; logic 1 indicates loss of signal.

## SFP Module EEPROM Information and Management

The SFP modules implement the 2-wire serial communication protocol as defined in the SFP -8472.

The serial ID information of the SFP modules and Digital Diagnostic Monitor parameters can be accessed through

the I2C interface at address A0h and A2h.

The memory is mapped in below figure.

Detailed ID information (A0h) is listed in Table 2. And the DDM specification at address A2h.

For more details of the memory map and byte definitions, please refer to the SFF-8472, "Digital Diagnostic

Monitoring Interface for Optical Transceivers". The DDM parameters have been internally calibrated.
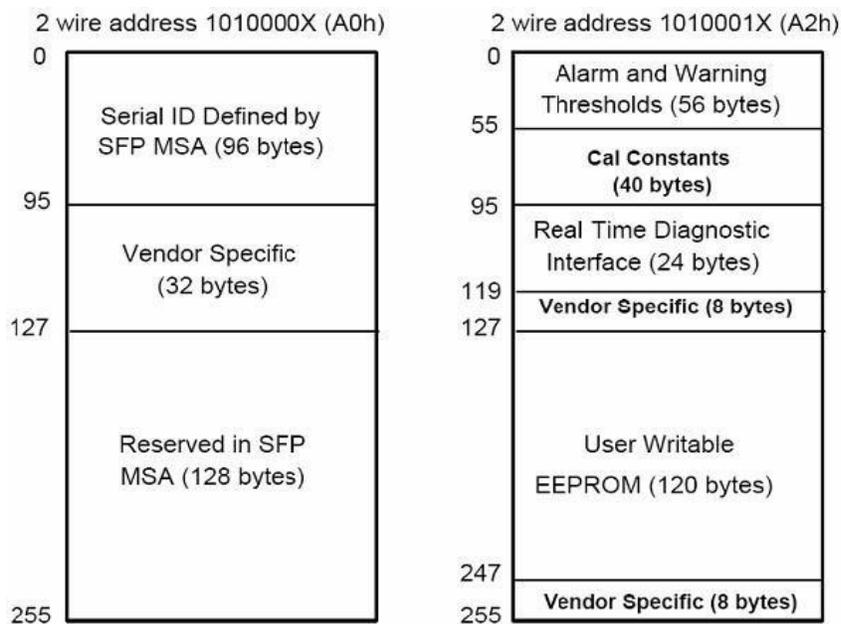
EEPROM Serial ID Memory Contents (A0h)

Data Address	Length (Byte)	Name of Length	Description and Contents
Base ID Fields			
0	1	Identifier	Type of Serial transceiver (03h=SFP)
1	1	Reserved	Extended identifier of type serial transceiver (04h)
2	1	Connector	Code of optical connector type (07=LC)
3-10	8	Transceiver	10G Base-ER
11	1	Encoding	64B/66B

Data Address	Length (Byte)	Name of Length	Description and Contents
12	1	BR, Nominal	Nominal baud rate, unit of 100Mbps
13-14	2	Reserved	(0000h)
15	1	Length(9um)	Link length supported for 9/125um fiber, units of 100m
16	1	Length(50um)	Link length supported for 50/125um fiber, units of 10m
17	1	Length(62.5um)	Link length supported for 62.5/125um fiber, units of 10m
18	1	Length(Copper)	Link length supported for copper, units of meters
19	1	Reserved	
20-35	16	Vendor Name	SFP vendor name: Ascent
36	1	Reserved	
37-39	3	Vendor OUI	SFP transceiver vendor OUI ID
40-55	16	Vendor PN	Part Number: "SFPP-ATLP-51-40" (ASCII)
56-59	4	Vendor rev	Revision level for part number
60-62	3	Reserved	
63	1	CCID	Least significant byte of sum of data in address 0-62
Extended ID Fields			
64-65	2	Option	Indicates which optical SFP signals are implemented (001Ah = LOS, TX_FAULT, TX_DISABLE all supported)
66	1	BR, max	Upper bit rate margin, units of %
67	1	BR, min	Lower bit rate margin, units of %
68-83	16	Vendor SN	Serial number (ASCII)
84-91	8	Date code	Manufacturing date code
92-94	3	Reserved	
95	1	CCEX	Check code for the extended ID Fields (addresses 64 to 94)
Vendor Specific ID Fields			
96-127	32	Readable	Specific date, read only
128-255	128	Reserved	Reserved for SFF-8079

Alarm and Warning Thresholds (A2h)

Data Address	Length (Byte)	Name of Length	Description and Contents
Base ID Fields			
00-01	2	Temp High Alarm	MSB at low address
02-03	2	Temp Low Alarm	MSB at low address
04-05	2	Temp High Warning	MSB at low address
06-07	2	Temp Low Warning	MSB at low address
08-09	2	Voltage High Alarm	MSB at low address
10-11	2	Voltage Low Alarm	MSB at low address
12-13	2	Voltage High Warning	MSB at low address
14-15	2	Voltage Low Warning	MSB at low address
16-17	2	Bias High Alarm	MSB at low address
18-19	2	Bias Low Alarm	MSB at low address
20-21	2	Bias High Warning	MSB at low address
22-23	2	Bias Low Warning	MSB at low address
24-25	2	TX Power High Alarm	MSB at low address
26-27	2	TX Power Low Alarm	MSB at low address

Data Address	Length (Byte)	Name of Length	Description and Contents
28-29	2	TX Power High Warning	MSB at low address
30-31	2	TX Power Low Warning	MSB at low address
32-33	2	RX Power High Alarm	MSB at low address
34-35	2	RX Power Low Alarm	MSB at low address
36-37	2	RX Power High Warning	MSB at low address
38-39	2	RX Power Low Warning	MSB at low address
40-41	2	Optional Laser Temp High Alarm	MSB at low address
42-43	2	Optional Laser Temp Low Alarm	MSB at low address
44-45	2	Optional Laser Temp High Warning	MSB at low address
46-47	2	Optional Laser Temp Low Warning	MSB at low address
48-49	2	Optional TEC Current High Alarm	MSB at low address
50-51	2	Optional TEC Current Low Alarm	MSB at low address
52-53	2	Optional TEC Current High Warning	MSB at low address
54-55	3	Optional TEC Current Low Warning	MSB at low address
56-91	36	Calibration Constants for External Calibration Option	Refer to the SFP 8472 Rev12.4
92-94	3	Reserved	
95	1	Checksum	Byte 95 contains the low order 8 bits of the sum of bytes 0-94

Real Time Diagnostic and Control Registers

Data Address	Length (Byte)	Name of Length	Description and Contents
96-110	15	A/D Values and Status Bits	Refer to the SFP 8472 Rev12.4
111	1	Reserved	Reserved (was assigned to SFF-8079).

Alarm and Warning Flag Bits

Data Address	Length (Byte)	Name of Length	Description and Contents
112-117	6	Optional Alarm and Warning Flag Bits	Refer to the SFP 8472 Rev12.4

Extended Module Control/Status Bytes

Data Address	Length (Byte)	Name of Length	Description and Contents
118-119	2	Extended Module Control/Status Bytes	Refer to the SFP 8472 Rev12.4

Optional Page Select Byte

Data Address	Length (Byte)	Name of Length	Description and Contents
120-126	7	Vendor Specific	Vendor specific memory addresses
127	1	Optional Page Select	Defines the page number for subsequent reads and writes to locations A2h

User Accessible EEPROM Locations

Data Address	Length (Byte)	Name of Length	Description and Contents
128-247	120	User EEPROM	User writable EEPROM

Vendor Specific Control Function Locations

248-255	8	Vendor Specific	Vendor specific control functions

Specifications

Absolute Maximum Ratings

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

Recommended Operating Conditions

Parameter	Symbol	Min.	Typ.	Max.	Unit	Note
Operating Case Temperature	T$_{op}$	0		+70	°C	SFPP-ATLP-51-40
		-40		+85	°C	SFPP-ATLP-51-40A
Power Supply Voltage	V$_{CC}$	3.13	3.3	3.47	V	
Data Rate	BR		10.3125	11.3	Gbps	
				5.5		
Transmission Distance	T$_D$			40	km	
Coupled fiber	Single-mode fiber					9/125 µm SMF

Electrical Characteristics (TOP = Tc, Vcc = 3.135 to 3.465 Volts)

Parameter	Symbol	Min	Typ	Max	Unit	Note
Transmitter						
Power Supply Voltage	Vcc	3.135		3.465	V	
Power Supply Current (Commercial)	Icc			450	mA	
Power Supply Current (Industrial)	Icc			540	mA	
Power Consumption (Commercial)	P			1.5	W	
Power Consumption (Industrial)	P			1.8	W	1
Transmitter Section						
CML Inputs(Differential)	Vin	150		1200	mVpp	1
Input Impedance(Differential)	Zin	85	100	115	ohm	
TX_DIS Disable		2		Vcc+0.3	V	
TX_DIS Enable		0		0.8	V	
TX_FAULT Fault		2		Vcc+0.3	V	
TX_FAULT Normal		0		0.5	V	
Receiver Section						
CML Outputs (Differential)	Vout	350		700	mVpp	1
Output Impedance (Differential)	Zout	85	100	115	Ohm	
RX_LOS LOS						
RX_LOS Normal		0		0.8	V	2
MOD_DEF (0:2) VoH		2.5			V	With Serial ID
MOD_DEF (0:2) VoL		0		0.5	V	With Serial ID

Notes:

1. CML logic, internally AC coupled.

2. Loss of Signal is LVTTL. Logic 0 indicates normal operation; logic 1 indicates no signal detected.

Optical Characteristics

Parameter	Symbol	Min.	Typ.	Max.	Unit	Note
Power Budget		14			dB	
Data Rate			10.3125	11.3	Gbps	
Transmitter						
Center Wavelength	λ_c	1530	1550	1565	nm	
Spectral Width (-20dB)	$\Delta\lambda$			1	nm	
Side Mode Suppression Ratio	SMSR	30			dB	
Average Output Power	P_{out}	-1		4	dBm	1
Extinction Ratio	ER	8.2			dB	
Average Power of OFF Transmitter	P_{off}			-30	dBm	
Relative Intensity Noise	RIN			-128	dB/Hz	2
Receiver						
Wavelength Range	λ_C	1270		1610	dBm	
Receiver Sensitivity	Pmin			-16	dBm	3
Receiver Overload	Pmax	0			dBm	
LOS De-Assert	LOSD			-17	dBm	
LOS Assert	LOSA	-30			dBm	
LOS-Hysteresis	Phys	0.5			dB	

Notes:

1. Output is coupled into a 9/125um SMF.

2. 12dB reflection.

3. Measured with worst ER, BER less than 1E-12 and PRBS $2^{31}-1$ at 10.3125 Gbps.

Ordering Information

Product Name	Product Description
SFPP-ATLP-51-40	SFP+ Plug-in, 10Gbps, 40km, TX=1550/RX wide, on two single mode fibers, LC/PC Blue
SFPP-ATLP-51-40A	SFP+ Plug-in, 10Gbps, 40km, TX=1550/RX wide, on two single mode fibers, LC/PC Blue, Industrial Temp -40 to +85°C
JSPP-ATLP-51-40	SFP+ Plug-in, 10Gbps, 40km, TX=1550/RX wide, on two single mode fibers, LC/PC Blue, Compatible with Juniper
JSPP-ATLP-51-40A	SFP+ Plug-in, 10Gbps, 40km, TX=1550/RX wide, on two single mode fibers, LC/PC Blue, Industrial Temp -40 °C to +85 °C, Compatible with Juniper

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Ver. ACT_SFPP-ATLP-51-40_Datasheet_V1h_May_2018