

10 Gb/s Single-Mode CWDM SFP+ 80 km Transceiver

SFP+ Series

- **1470 nm to 1610 nm**
- **Up to 11.3 Gbps data rate**
- **Up to 80 km transmission distance**
- **Metal enclosure**
- **Hot-pluggable SFP+ footprint**
- **Compliant with SFF 8472**
- **Compliant with SFF 8431**
- **Low power dissipation**
- **Digital diagnostic monitoring**
- **RoHS compliant**



ASCENT's CWDM SFP+ transceivers are designed for use in 10-Gigabit Ethernet links with distances up to 80 km over single-mode fiber. These transceivers include an APD receiver and CWDM EML transmitter. Digital diagnostic functions are available via an I2C interface. This module is designed for single-mode fiber and operates at wavelengths between 1470 nm to 1610 nm.

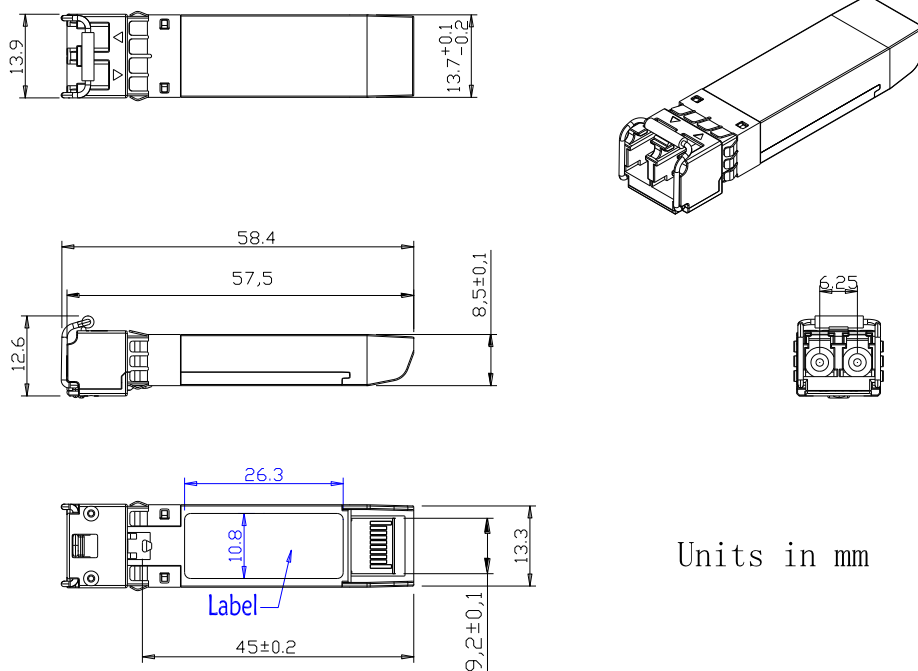
ASCENT SFP+ transceivers provide a unique enhanced digital diagnostic monitoring interface which allows real-time access to device operating parameters such as transceiver temperature, laser bias current, transmitted optical power, received optical power, and transceiver supply voltage. It also defines a sophisticated system of alarm and warning flags which alerts end users when particular operating parameters are outside of a factory set normal range.

ASCENT's 10G CWDM SFP+ transceivers are compliant with SFF 8472 standards, and offer a convenient solution for 10GBASE-LR/LW, 10G SONET/SDH, and OTU2/2e applications.

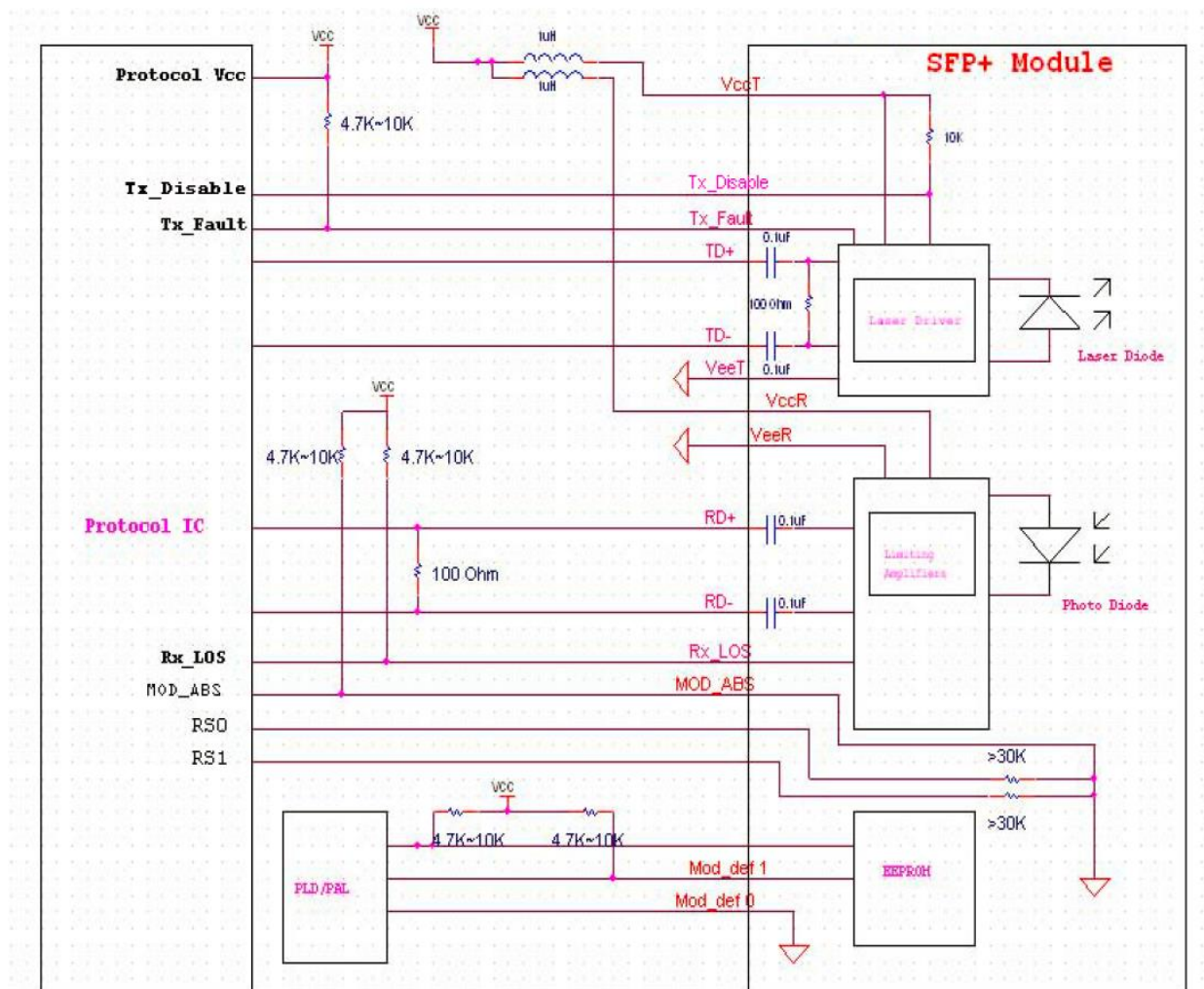
Key Features

- Up to 11.3Gbps Data Links
- Up to 80km transmission on SMF
- CWDM EML transmitter and APD receiver
- Metal enclosure for lower EMI
- 2-wire interface with integrated Digital Diagnostic monitoring
- Hot-pluggable SFP+ footprint
- Compliant with SFF 8472 and SFF 8431
- Compliant with SFP+ MSA with LC connector
- Single 3.3V power supply
- Commercial/Industrial case operating temperature range: 0 °C to +70 °C / -40 °C to +85 °C
- Without CDR (standard) or with CDR supported 9.95 Gb/s to 11.3Gb/s reference-free
- Low power dissipation

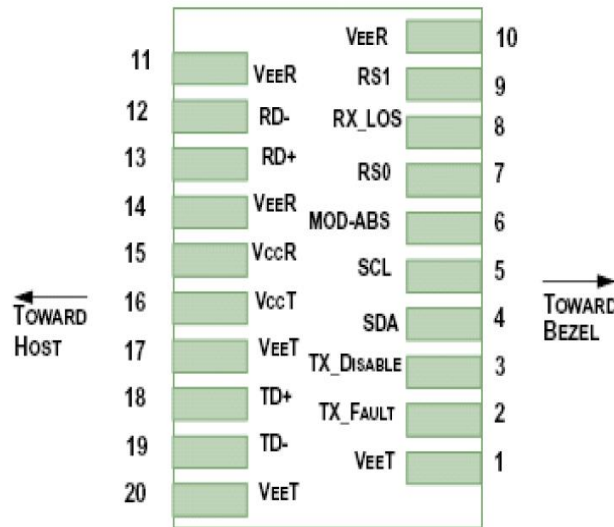
Outline Dimensions



Host - Transceiver Interface Block Diagram



Pin Assignment



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	No connection	
8	LOS	Loss of Signal indication. Logic 0 indicates normal operation.	6
9	RS1	Internally connect to circuit ground	
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 LVTTTL output. A high output indicates a transmitter fault caused by either the TX bias current or the TX output power or the laser temperature exceeding the preset alarm thresholds. A low output

indicates normal operation. In the low state, the output is pulled to <0.8 V. Laser output disabled on T_{DIS} > 2.0 V or open, enabled on T_{DIS} < 0.8 V.

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 Ω to 10 k Ω on host board to a typical 3.3 V voltage. MOD_ABS pulls line low to indicate module is plugged in.
5. LOS is open collector output. It should be pulled up with 4.7 k Ω to 10 k Ω on host board to a voltage between 2.0V and 3.6V. 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 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

Digital Diagnostic Functions

ASCENT SFPP-ATLP-CXX-80 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	Note
Storage Temperature	Ts	-40	-	85	°C	
Relative Humidity	RH	5	-	95	%	
Power Supply Voltage	VCC	-0.3	-	4	V	
Signal Input Voltage		Vcc-0.3	-	Vcc+0.3	V	

Recommended Operating Conditions

Parameter	Symbol	Min.	Typ.	Max.	Unit	Note
Case Operating Temperature	Tcase	0	-	70	°C	Commercial
		-40	-	85	°C	Industrial
Power Supply Voltage	VCC	3.14	3.3	3.47	V	
Power Supply Current	ICC	-		450	mA	
Data Rate	BR		10.3125	11.3	Gbps	
Transmission Distance	TD		-	80	km	
Coupled fiber	Single-mode fiber					9/125 μm SMF

Optical Characteristics

Parameter	Symbol	Min.	Typ.	Max.	Unit	Note
Transmitter						
Average Launched Power	PO	-1		4	dBm	1
Extinction Ratio	ER	8.2			dB	
Center Wavelength	λc	λc-6.5		λc+6.5	nm	2
Spectrum Band Width (-20dB)	σ			1.0	nm	
SMSR		30			dB	
Transmitter OFF Output Power	Poff			-30	dBm	
Transmitter and Dispersion Penalty	TDP			3.0	dB	
Output Eye Mask		Compliant with IEEE 802.3ae				
Receiver						
Input Optical Wavelength	λ	1270		1610	nm	
Receiver Sensitivity	Psen			-23.0	dBm	3
Input Saturation Power (Overload)	Psat	-6			dBm	
LOS Assert	LOSA	-35			dBm	
LOS De-assert	LOSD			-26	dBm	
LOS Detect Hysteresis	Phys	0.5			dB	

Notes:

1. Launched power (avg.) is power coupled into a single-mode fiber with master connector. (Before of Life)
2. For λc refer to wavelength selection
3. Measured with conformance test signal for BER = 10^{-12} @ 10.3125 Gbps, PRBS = $2^{31}-1$, NRZ, Optical source with worst ER, Wavelength between 1470 nm and 1610 nm; back to back.

Electrical Characteristics

Parameter	Symbol	Min	Typ.	Max	Unit	Note
Supply Voltage	Vcc	3.14	3.3	3.46	V	
Supply Current (Note 1)	Icc			430	mA	SFPP-ATLP-CXX-80
				490	mA	SFPP-ATLP-CXX-80A
				460	mA	SFPP-ATLP-CXX-80C
				520	mA	SFPP-ATLP-CXX-80CA
Transmitter						
Input Differential Impedance	Rin		100		Ω	2
Differential Data Input Swing	Vin, pp	180		700	mV	
Transmit Disable Voltage	VDis	2.0		Vcc	V	
Transmit Enable Voltage	VEN	Vee		Vee+ 0.8	V	3
Transmit Disable Assert Time				10	µs	
Receiver						
Differential Data Output Swing	Vout, pp	300		850	mV	4
Data Output Rise Time	tr	30			ps	5
Data Output Fall Time	tf	30			ps	5
LOS Output High Level	VLOS-H	2.0		VCCHOST	V	6
LOS Output Low Level	VLOS-L	Vee		Vee+0.8	V	6

Notes:

1. Measured with receive Pin = P_{sen}, V_{cc} = 3.3 V, operation temperature range, without air flow.
2. Connected directly to TX data input pins. AC coupled.
3. Or open circuit.
4. Input 100 Ω differential termination.
5. These are unfiltered 20 % to 80 % values.
6. Loss Of Signal is LVTTTL. Logic 0 indicates normal operation; logic 1 indicates no signal detected.

Ordering Information

Product part Number	Media	Wavelength (nm)	Transmission Distance	Temperature Range (Tcase)	With/Without CDR
SFPP-ATLP-CXX-80	Single-mode fiber	Refer to wavelength selection	80 km	0 °C to +70 °C	Without CDR
SFPP-ATLP-CXX-80A	Single-mode fiber	Refer to wavelength selection	80 km	-40 °C to +85 °C	Without CDR
SFPP-ATLP-CXX-80C	Single-mode fiber	Refer to wavelength selection	80 km	0 °C to +70 °C	With CDR
SFPP-ATLP-CXX-80CA	Single-mode fiber	Refer to wavelength selection	80 km	-40 °C to +85 °C	With CDR

Note: Max. Transmission Distance is 70 km for input wavelength 1570 nm, 1590 nm, and 1610 nm

Product Name	Product Description
SFPP-ATLP-CXX-80	SFP+ Plug-in, 10 Gbps, 80 km, TX = CWDM Ch xx (1470 nm to 1610 nm)/RX wide, on two single-mode fibers, LC/PC Blue.

Wavelength	XX	Clasp Color Code	Wavelength	XX	Clasp Color Code
1470 nm	47	Gray	1550 nm	55	Yellow
1490 nm	49	Purple	1570 nm	57	Orange
1510 nm	51	Blue	1590 nm	59	Red
1530 nm	53	Green	1610 nm	61	Brown

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