

DWDM SFP+ 10 Gbps, 40 km Optical Transceiver



SFP+ Series

- DWDM ITU (ch 17 to 61)
- Up to 11.3 Gbps data rate
- Up to 40 km transmission distance on SMF
- Metal enclosure
- Hot-pluggable SFP+ footprint
- Compliant with SFF 8431 and SFF 8472
- 10GBASE-ER/EW
- 40 km 10 G Fibre Channel
- 10G Ethernet with FEC

ASCENT DWDM ITU Channel SFP+ transceivers are designed for use in 10-Gigabit Ethernet links with distances up to 40 km over single-mode fiber. These transceivers include a PIN photo detector diode and temperature stabilized DFB-EML transmitter. Digital diagnostic functions are available via an I2C interface. This module is designed for single-mode fiber and operates at a nominal wavelength of 100 GHz ITU Grid, C Band DWDM wavelength.

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 10G DWDM SFP+ transceivers are compliant with SFF 8472 standards, and offer a convenient solution for 10GBASE-ER and 10GBASE-EW applications.

Key Features

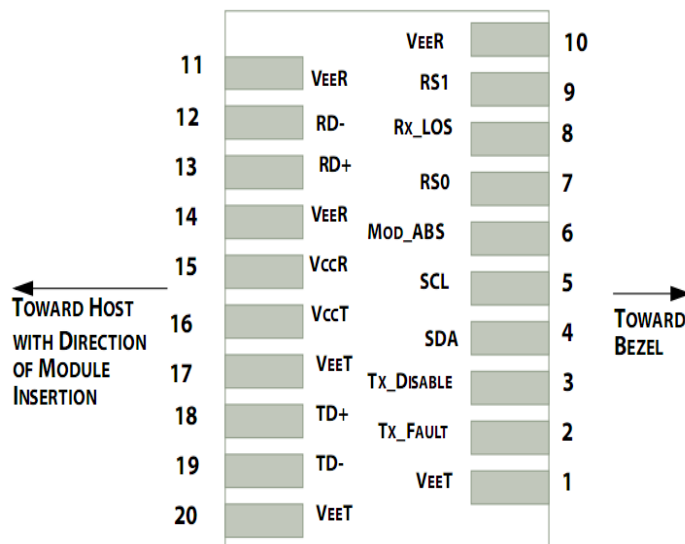
- Up to 11.3 Gbps data rate
- Up to 40 km transmission distance on SMF
- DWDM EML laser and PIN receiver
- Metal enclosure, for lower EMI
- 2-wire interface with integrated Digital Diagnostic monitoring
- Hot-pluggable SFP+ footprint
- Compliant with SFF 8431 and SFF 8472
- Compliant with SFP+ MSA with LC connector
- Single 3.3 V power supply
- Case operating temperature range: -40 °C to +85 °C (industrial) 0 °C to +70°C (commercial)
- Power dissipation < 1.6 W

C-band λ_c Wavelength Guide Pin Descriptions

Channel	Wavelength (nm)	Frequency (THZ)	Channel	Wavelength (nm)	Frequency (THZ)
C17	1563.86	191.70	C39	1546.12	193.90
C18	1563.05	191.80	C40	1545.32	194.00
C19	1562.23	191.90	C41	1544.53	194.10
C20	1561.42	192.00	C42	1543.73	194.20
C21	1560.61	192.10	C43	1542.94	194.30
C22	1559.79	192.20	C44	1542.14	194.40
C23	1558.98	192.30	C45	1541.35	194.50
C24	1558.17	192.40	C46	1540.56	194.60
C25	1557.36	192.50	C47	1539.77	194.70
C26	1556.55	192.60	C48	1538.98	194.80
C27	1555.75	192.70	C49	1538.19	194.90
C28	1554.94	192.80	C50	1537.4	195.00
C29	1554.13	192.90	C51	1536.61	195.10
C30	1553.33	193.00	C52	1535.82	195.20
C31	1552.52	193.10	C53	1535.04	195.30
C32	1551.72	193.20	C54	1534.25	195.40
C33	1550.92	193.30	C55	1533.47	195.50
C34	1550.12	193.40	C56	1532.68	195.60
C35	1549.32	193.50	C57	1531.9	195.70
C36	1548.51	193.60	C58	1531.12	195.80

C37	1547.72	193.70	C59	1530.33	195.90
C38	1546.92	193.80	C60	1529.55	196.00
Non-ITU	Peak wavelength between 1528.77 nm to 1563.86 nm		C61	1528.77	196.10

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	Rate Select 0	5
8	LOS	Loss of Signal indication. Logic 0 indicates normal operation.	6
9	RS1	No connection required	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

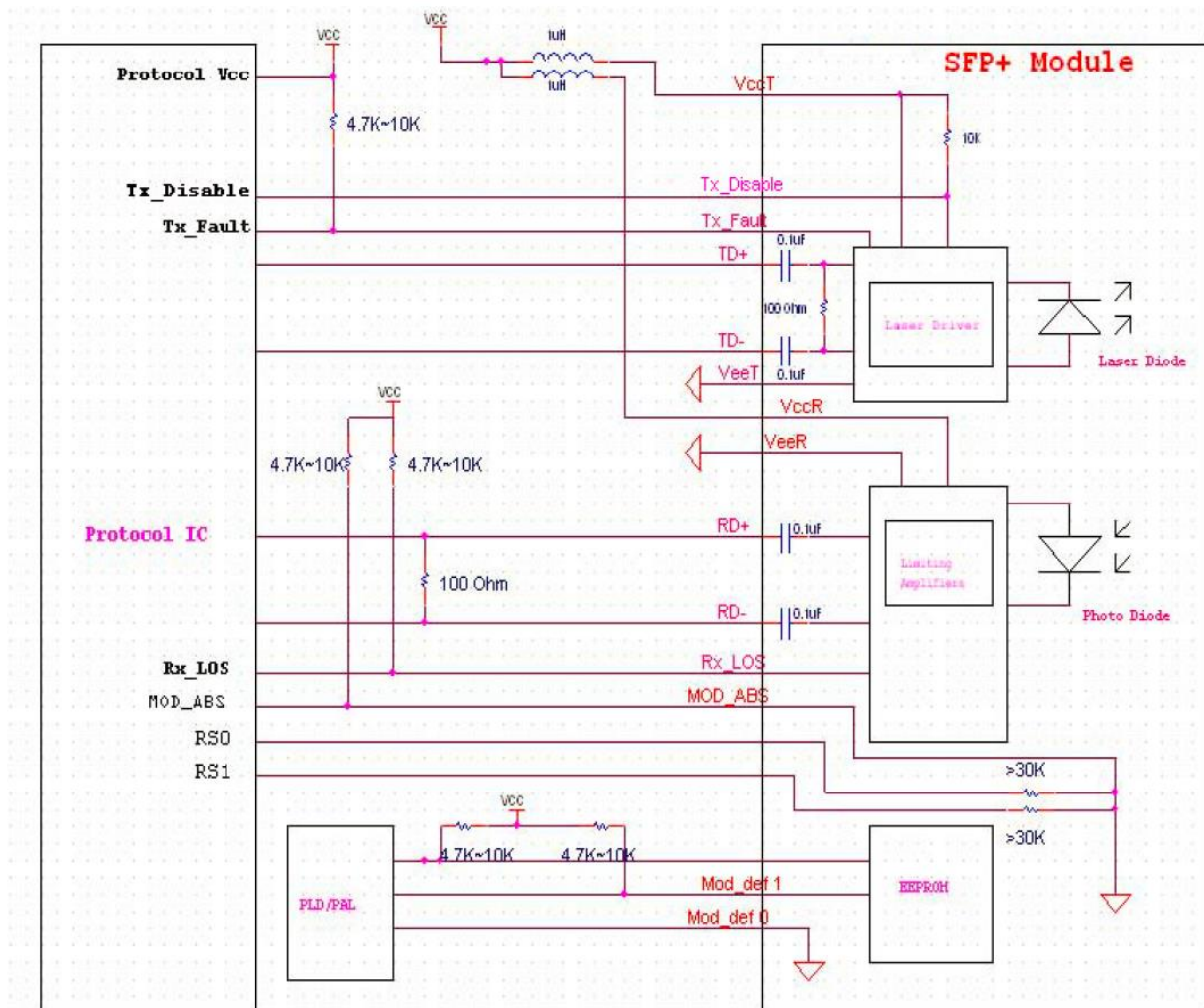
Notes:

1. Circuit ground is internally isolated from chassis ground.
2. TFAULT is an open collector/drain output, which should be pulled up with a 4.7 kΩ to 10 kΩ resistor on the host board if intended for use. Pull up voltage should be between 2.0 V to Vcc + 0.3 V. 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 TDIS > 2.0 V or open, enabled on TDIS < 0.8 V.
4. Should be pulled up with 4.7 kΩ to 10 kΩ host board to a voltage between 2.0 V and 3.6 V. 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 4.7 kΩ to 10 kΩ on host board to a voltage between 2.0V and 3.6V. Logic 0 indicates normal operation; logic 1 indicates loss of signal.

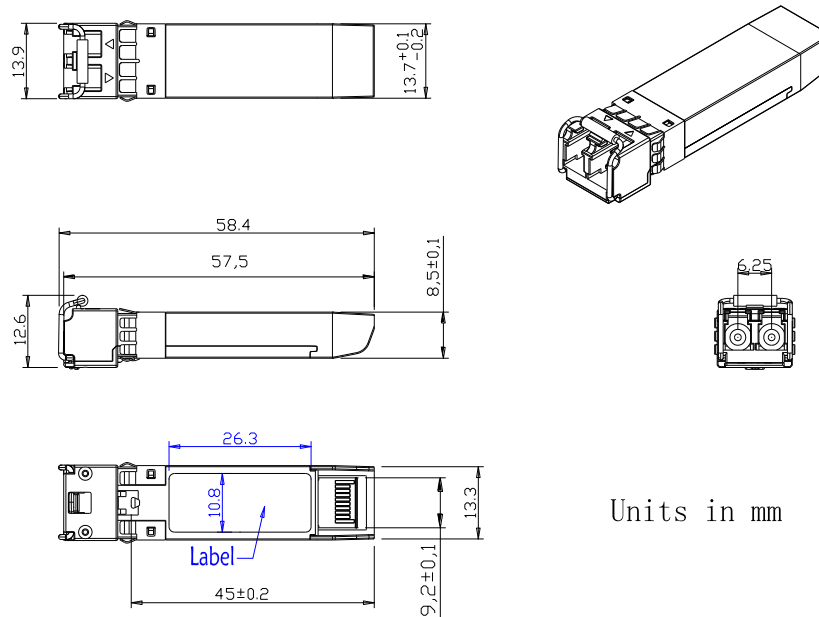
Regulatory Compliance

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

Host - Transceiver Interface Block Diagram



Outline Dimensions



Digital Diagnostic Functions

ASCENT SFPP-ATLP-DXX-40A 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	Notes
Storage Temperature	T _s	-40		85	°C	
Relative Humidity	RH	5		95	%	
Power Supply Voltage	V _{cc}	-0.3		4.0	V	
Signal Input Voltage		V _{cc} - 0.3		V _{cc} + 0.3	V	

Recommended Operating Conditions

Parameter	Symbol	Min.	Typ.	Max.	Unit	Notes
Case Operating Temperature	T _{case}	0		70	°C	SFPP-ATLP-DXX-40
		-40		85	°C	SFPP-ATLP-DXX-40A
Power Supply Voltage	V _{cc}	3.14	3.3	3.47	V	
Data Rate	BR		10.3125		Gbps	
Transmission Distance	TD			40	km	
Coupled Fiber	Single-mode fiber					9/125 μm SMF

Optical Characteristics

Parameter	Symbol	Min.	Typ.	Max.	Unit	Notes
Transmitter						
Average Optical Power	P _{out}	-1		+3	dBm	1
Optical Extinction Ratio	ER	8.2			dB	
Center Wavelength	λ _c	λ _c - 0.1		λ _c + 0.1	nm	2
Center Wavelength Spacing			100		GHz	2
Spectrum Bandwidth (-20 dB)	σ			1.0	nm	
Side Mode Suppression Ratio	SMSR	30			dB	
Average Launch Power (Laser Off)	P _{off}			-30	dBm	
Transmitter and Dispersion Penalty	TDP			2.0	dB	
Output Eye Mask	Compliant with IEE 802.3ae					
Receiver						
Input Optical Wavelength	λ _c	1270		1610	nm	
Receiver Sensitivity	P _{sen}			-16.0	dBm	3
Input Saturation Power (Overload)	P _{sat}	0			dBm	
LOS Assert	LOSA	-28			dBm	
LOS De-assert	LOSD			-19	dBm	
LOS Detect Hysteresis	P _{hys}	0.5			dB	

Notes:

1. Launched power (avg.) is power coupled into a single-mode fiber with master connector. (Before of Life)
2. λ_c refer to wavelength selection, and corresponds to approximately 0.8 nm.
3. Measured with conformance test signal for BER = 10⁻¹².@10.3125 Gbps, PRBS=2³¹-1, NRZ, optical source with worst ER, wavelength between 1528.77 nm and 1563.86 nm; back to back.

Electrical Characteristics

Parameter	Symbol	Min	Typ.	Max	Unit	Notes
Supply Voltage	V _{CC}	3.14	3.3	3.46	V	
Supply Current ¹	I _{CC}			400	mA	SFPP-ATLP-DXX-40
				460	mA	SFPP-ATLP-DXX-40A
Transmitter						
Input Differential Impedance	R _{IN}		100		Ω	2
Single-ended Data Input Swing	V _{IN-pp}	180		700	mV	
Transmit Disable Voltage	V _{DIS}	2.0		V _{CC}	V	3
Transmit Enable Voltage	V _{EN}	V _{EE}		V _{EE} + 0.8	V	
Transmit Disable Assert Time				10	μs	
Receiver						
Differential Data Output Swing	V _{OUT-pp}	400		800	mV	4
Data Output Rise Time	t _r	28			ps	5
Data Output Fall Time	t _f	28			ps	5
LOS Output High Level	V _{LOS-H}	2.0		V _{CCHOST}	V	6
LOS Output Low Level	V _{LOS-L}	V _{EE}		V _{EE} +0.8	V	6
Power Supply Rejection	PSR	100			mV _{pp}	7

Notes:

1. Measured with receive Pin = Psen, V_{CC} = 3.3V, operation temperature range, without air flow
2. Connected directly to TX data input pins. AC coupled.
3. Or open circuit.
4. Into 100 ohms differential termination.
5. 20 – 80 %.
6. Loss of Signal is LVTTTL. Logic 0 indicates normal operation; logic 1 indicates no signal detected.
7. Receiver sensitivity is compliant with power supply sinusoidal modulation of 20 Hz to 1.5 MHz up to specified value applied through the recommended power supply filtering network.

Ordering Information

Item	Description
SFPP-ATLP-DXX-40	SFP+ Plug-in, 10 Gbps, 40 km, TX=ITU Ch xx (17 to 61) /RX wide, on two single-mode fibers, LC/PC Blue
SFPP-ATLP-DXX-40A	SFP+ Plug-in, 10 Gbps, 40 km, TX=ITU Ch xx (17 to 61) /RX wide, on two single mode fibers, LC/PC Blue, Industry Temp

Contact Information

Ascent Communication Technology Ltd

AUSTRALIA

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

HONG KONG SAR

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

CHINA

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

USA

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

EUROPE

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

VIETNAM

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

WEB: www.ascentcomtec.com

EMAIL: sales@ascentcomtec.com

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