32G FC 1310 nm 10 km SFP28 Transceiver

SFP28 Series

- Up to 28.05 Gb/s bit rates
- Up to 10 km transmission on SMF
- DFB Laser and PIN receiver
- Metal enclosure, for lower EMI
- 2-wire interface with integrated Digital Diagnostic monitoring
- Compliant with SFP+ MSA with LC connector
- Single 3.3V power supply
- Power dissipation < 1.5 W
- Compliant to SFF-8431
- Compliant to SFF 8472
- RoHS Compliant

Ascent's SFP28 32 Gb/s transceiver is an integrated fiber optic transceiver that provides a high-speed serial link at signaling rates up to 28.05 Gb/s. It is a single-channel, pluggable, fiber-optic module for short and medium-range data communication and interconnect Ethernet applications.

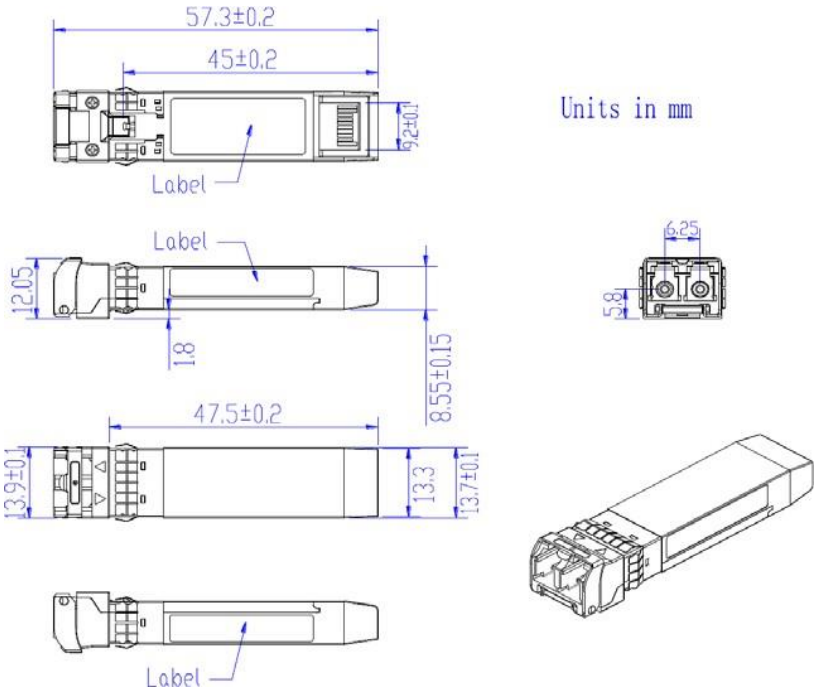
This module is designed to operate over single-mode fiber systems using a nominal wavelength of 1310 nm. It has a transmission distance of up to 10 km over SMF. The optical interface uses duplex LC receptacle.

The SFP28-32LP-31-10 module complies with SFF-8431 and SFF 8472 standards. It features a metal enclosure for lower EMI and utilizes a 2-wire interface that is compliant with the serial communication protocol as defined in the SFP+ MSA. It also provides a unique integrated digital diagnostic monitoring interface, allowing for real-time access to device operating parameters. This module is hot-pluggable.

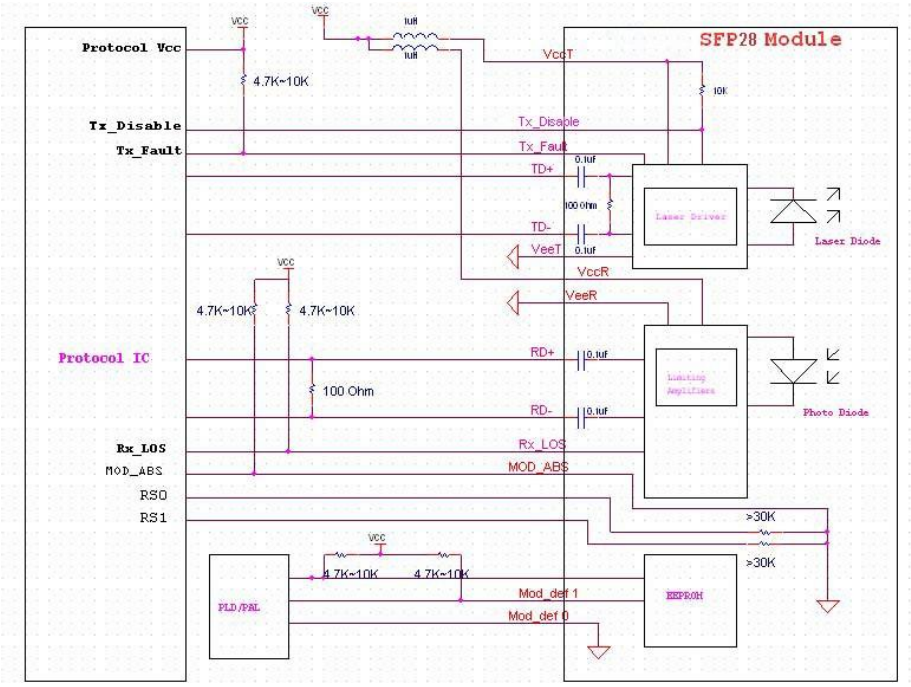
Key Features

- Up to 28.05 Gb/s bit rates
- Up to 10 km transmission on SMF
- DFB Laser and PIN receiver
- Metal enclosure, for lower EMI
- 2-wire interface with integrated Digital Diagnostic monitoring
- Compliant with SFP+ MSA with LC connector
- Single 3.3V power supply
- Power dissipation < 1.5 W
- Case operating temperature range: commercial: 0°C to +70°C, extended: 0°C to +85°C
- Compliant to SFF-8431
- Compliant to SFF 8472
- RoHS Compliant

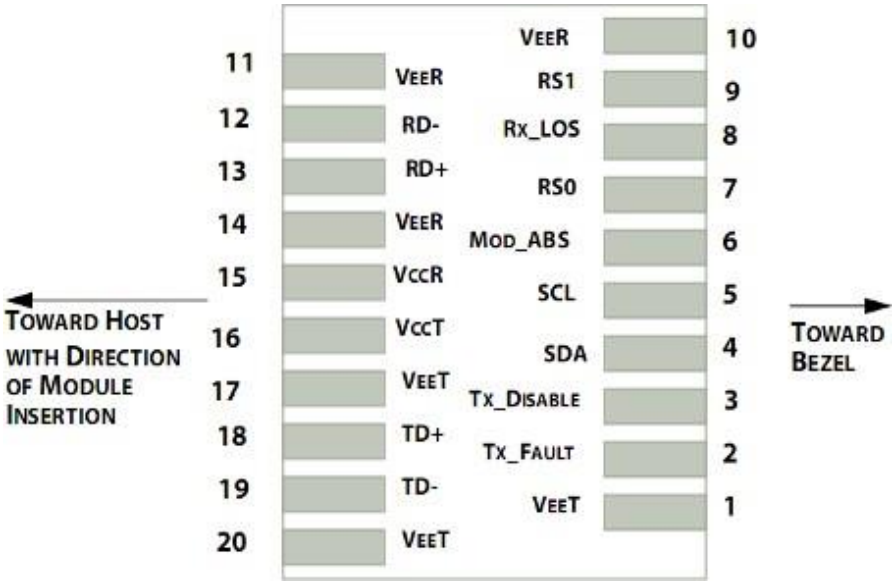
Outline Dimensions



Host – Transceiver Interface Block Diagram



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.	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. T_{FAULT} 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 T_{DIS} > 2.0 V or open, enabled on T_{DIS} < 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 an open collector output. It should be pulled up with 4.7 kΩ to 10 kΩ on the host board to a voltage between 2.0 V and 3.6 V. 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 55022 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	2011/65/EUI and (EU)2015/863	Compatible with standards
EMC	EN61000-3	Compatible with standards

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	-0.5	-	4.0	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
		0	-	85	°C	Extended
Power Supply Voltage	VCC	3.14	3.30	3.47	V	
Power Supply Current	ICC	-		450	mA	
			8.5		Gbps	1
Data Rate	BR		14.025			
			28.05			
Bit Error Rate	BER			10^{-12}	Gbps	2
				10^{-6}		3
Transmission Distance	TD		-	10	km	
Coupled Fiber	Single-mode fiber					

Notes:

1. 8x, Fibre Channel compatible, per FC-PI-41
2. PRBS 2^7-1 for 8GFC. PRBS 2^{31}-1 for 16GFC
3. FEC for 32GFC

Optical Characteristics

Parameter	Symbol	Min.	Typ.	Max.	Unit	Note
Transmitter						
Average Output Power, 28.05 Gb/s & 14.025 Gb/s	POUT	-5		+2.0	dBm	1, 2
Average Output Power, 8.5 Gb/s	POUT	-8.4		+0.5	dBm	1
Optical Wavelength	λ	1295		1325	nm	
Spectral Width (RMS)	σ			1	nm	
Optical Modulation Amplitude						
8.5 Gb/s	OMA	-5.4		+3	dBm	
14.025 Gb/s		-2.0				
28.05 Gb/s		-2.0				
Transmitter Dispersion Penalty						
8.5 Gb/s	TDP			3.2	dB	

14.025 Gb/s			4.4		
28.05 Gb/s			2.7		
Optical Extinction Ratio					
8.5 Gb/s & 14.025 Gb/s	ER	3.5		dB	
28.05 Gb/s		4.0			
Relative Intensity Noise					
8.5Gb/s	RIN		-128	dB/Hz	
14.025Gb/s			-130		
28.05Gb/s			-130		
Receiver					
Unstressed Receiver OMA Sensitivity					
8.5 Gb/s	RSENS		-13.8	dBm	3
14.025 Gb/s			-12.0		
28.05 Gb/s			-11.4		
Average Receiver Power	RxMAX		2	dBm	
Optical Return Loss					
8.5 Gb/s & 14.025 Gb/s		12		dB	
28.05 Gb/s		26			
LOS De -Assert	LOSD		-17	dBm	
LOS Assert	LOSA	-30		dBm	
LOS Hysteresis		0.5		dB	

Notes:

1. Class 1 Laser Safety limit per FDA/CDRH, and EN (IEC) 60825 laser safety standards
2. 3200-SM-LC-L OMA in dBm shall also exceed -5.0 TDP
3. For 32GFC with FEC, receiver sensitivity is defined at 10^{-6} BER level, not 10^{-12} BER level

Electrical Characteristics

Parameter	Symbol	Min.	Typ.	Max.	Unit	Note
Supply Voltage	Vcc	3.14	3.3	3.46	V	
Supply Current	Icc			450	mA	1
Transmitter						
Input Differential Impedance	Rin		100		Ω	2
Differential Data Input Eye Height	Vin, pp	250		900	mV	2
Transmit Disable Voltage	VD	Vcc–1.3		Vcc	V	3
Transmit Enable Voltage	VEN	Vee		Vee+ 0.8	V	
Receiver						
Differential Data Output Swing	Vout, pp	300		1000	mV	4
LOS Fault	VLOS fault	Vcc–1.3		VccHOST	V	5
LOS Normal	VLOS norm	Vee		Vee+0.8	V	5

Notes:

1. With established link, the total power dissipation shall not exceed 1.3 W
2. Connected directly to TX data input pins. AC coupling from pins into CDR, BER contour 10^{-6}

3. Or open circuit

3. Into 100 Ω differential termination

4. LOS is an open collector output. Should be pulled up with 4.7 kΩ to 10 kΩ on the host board. Normal operation is logic 0; loss of signal is logic 1. Maximum pull-up voltage is 5.5 V.

Digital Diagnostic Functions

ASCENT SFP28-32LP-31-10 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.

Ordering Information

Product Name	Product Description
SFP28-32LP-31-10	SFP28 Plug-in, 32Base-LR, 28Gbps, 10km, TX/RX 1310nm, on two SMF fibres, LC/PC

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Ver. ACT_SFP28-32LP-31-10_Datasheet_V1b_Jun_2022