2.5 Gb/s 1310nm Single-mode SFP Transceiver

SFP Series

- **Up to 2.5Gbps data rate**

- **1310nm DFB Laser Transmitter**

- **20km with 9/125µm SMF**

- **Single +3.3V power supply**

- **Compliant with SFF-8472**

- **Hot-pluggable SFP+ footprint**

- **Compliant with MSA SFP Specification**

Ascent's 2.5 Gb/s 1310 nm Small Form-Factor Pluggable (SFP) transceiver is a flexible solution as an interface for switches, routers, servers, and other optical links.

The transceiver consists of five sections: the LD driver, the limiting amplifier, the digital diagnostics monitor, the 1310 nm DFB laser, and the PIN photo-detector.

The module can carry data links up to 20 km in a 9/125 µm single mode fiber, and is compatible with the SFP Multi- Sourcing Agreement (MSA).

The optical output of the transceiver can be disabled using a high-level TTL logic TX disable input, and the system can also be disabled via I2C. TX Fault is provided to indicate any degradation of the laser.

A loss of signal (LOS) output is provided to indicate if there are any losses in the input optical signal of the receiver or if there are any problems with the link status of partner devices. The system can also obtain the LOS (or Link) / Disable / Fault information using an I2C register access.

Key Features

- Operating Data Rate up to 2.5Gbps

- 1310nm DFB Laser Transmitter

- 2.5Gb/s PIN-TIA photodiode receiver

- 20km with 9/125µm SMF

- Single 3.3V Power Supply

- Hot-Pluggable SFP Footprint Duplex LC Connector Interface

- Operating Temperature 0°C ~70°C

- Compliant with SFF-8472

- Compliant with MSA SFP Specification

- Class 1 FDA and IEC60825-1 Laser Safety Compliant

Outline Dimensions
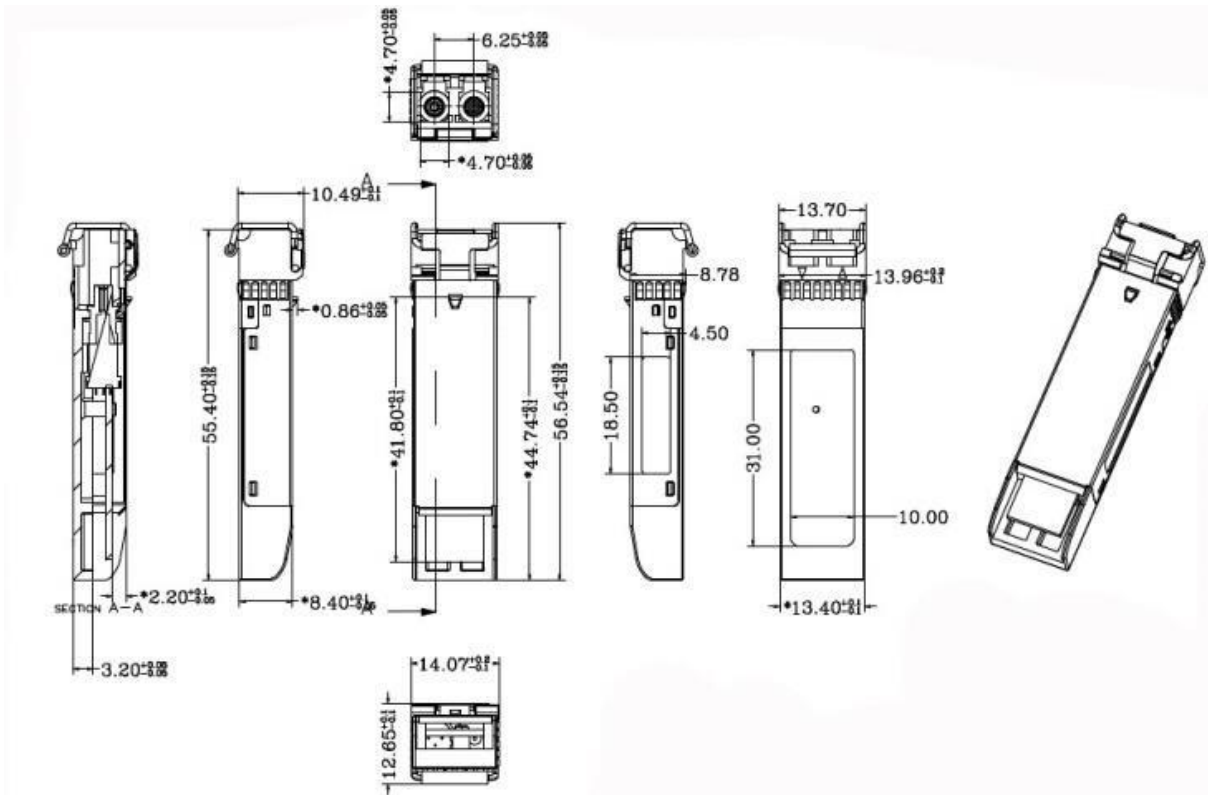
Circuit Schematic
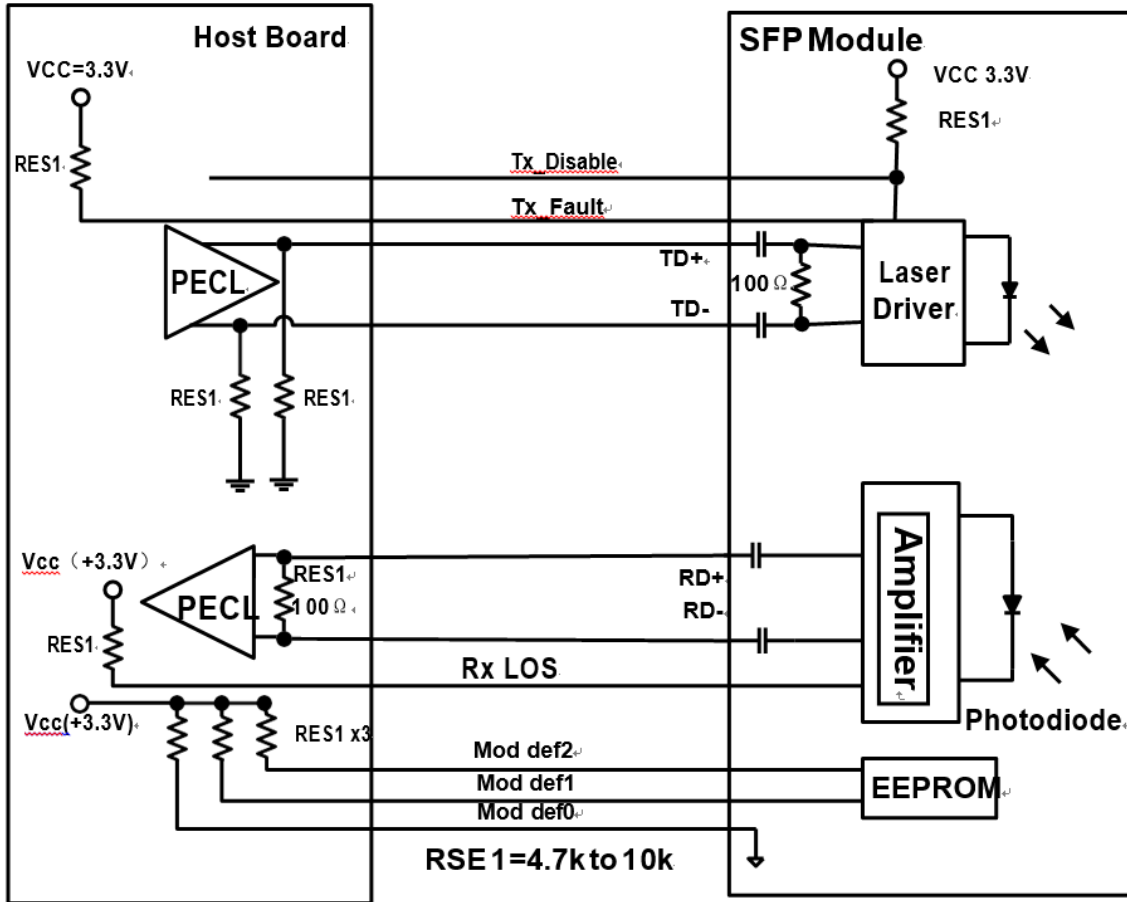
Pin Descriptions

Pin	Symbol	Name/Description	Plug Seq	Note
1	V_{EET}	Transmitter Ground (Common with Receiver Ground)	1	5
2	T_{FAULT}	Transmitter Fault	3	1
3	T_{DIS}	Transmitter Disable. Laser output disabled on high or open.	3	2
4	MOD_DEF(2)	Module Definition 2. Data line for Serial ID.	3	3
5	MOD_DEF(1)	Module Definition 1. Clock line for Serial ID.	3	3
6	MOD_DEF(0)	Module Definition 0. Grounded within the module.	3	3
7	Rate Select	No connection required	3	Function not available
8	LOS	Loss of Signal indication. Logic 0 indicates normal operation.	3	4
9	V_{EER}	Receiver Ground	1	5
10	V_{EER}	Receiver Ground	1	5
11	V_{EER}	Receiver Ground	1	5
12	R_{D-}	Inv. Received Data Out	3	6
13	R_{D+}	Received Data Out	3	7
14	V_{EER}	Receiver Ground	1	5
15	V_{CCR}	Receiver Power	2	7
16	V_{CCT}	Transmitter Power	2	7
17	V_{EET}	Transmitter Ground	1	5
18	TD+	Transmit Data In	3	8
19	TD-	Inv. Transmit Data In	3	8
20	V_{EET}	Transmitter Ground	1	5

Notes:

1. TX Fault is an open collector/drain output, which should be pulled up with a 4.7K–10K resistor on the host board. Pull up voltage between 2.0V and VccT/ R+0.3V. When high, output indicates a laser fault of some kind. Low indicates normal operation. In the low state, the output will be pulled to < 0.8V.

2. TX disable is an input that is used to shut down the transmitter optical output. It is pulled up within the module with a 4.7 – 10K resistor. Its states are:

Low (0 – 0.8V): Transmitter on (>0.8, < 2.0V): Undefined;

High (2.0 – 3.465V): Transmitter Disabled Open: Transmitter Disabled;

3. Mod-Def 0, 1, 2. These are the module definition pins. They should be pulled up with a 4.7K -10k resistor on the host board. The pull-up voltage shall be VccT or VccR.

Mod-Def 0 is grounded by the module to indicate that the module is present;

Mod-Def 1 is the clock line of two wire serial interface for serial ID;

Mod-Def 2 is the data line of two wire serial interface for serial ID.

4. LOS (Loss of Signal) is an open collector/drain output, which should be pulled up with a 4.7K –10K resistor. Pull up voltage between 2.0V and VccT/R+0.3V. When high, this output indicates the received optical power is below the worst-case receiver Sensitivity (as defined by the standard in use). Low indicates normal operation. In the low state, the output will be pulled to <0.8V.

5.VeeR and VeeT may be internally connected within the SFP module.

6. RD-/+: These are the differential receiver outputs. They are AC coupled 100 differential Lines which should be terminated with 100 (differential) at the user SERDES. The AC coupling is done inside the module and is thus not required on the host board. The voltage swing on these lines will be between 400 and 2000mV differential (200 –1000mV single ended) when properly terminated.

7. VccR and VccT are the receiver and transmitter power supplies. They are defined as 3.3V±5% at the SFP connector pin. Maximum supply current is 300mA. Recommended host board power supply filtering is shown below. Inductors with DC resistance of less than 1 ohm should be used in order to maintain the required voltage at the SFP input pin with 3.3V supply voltage When the recommended supply- filtering network is used, hot plugging of the SFP transceiver module will result in an in rush current of no more than 30mA greater than the steady state value. VccR and VccT may be internally connected within the SFP transceiver module.

8. TD-/+: These are the differential transmitter inputs. They are AC-coupled, differential lines with 100 differential terminations inside the module. The AC coupling is done inside the module and is thus not required on the host board. The inputs will accept differential swings of 400 – 2000mV (200 – 1000mV single-ended).

EEPROM

The serial interface uses the 2-wire serial CMOS EEPROM protocol defined. When the serial protocol is activated, the host generates the serial clock signal (SCL). The positive edge clocks data into those segments of the EEPROM that are not write protected within the SFP transceiver. The negative edge clocks data from the SFP transceiver. The serial data signal (SDA) 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. The Module provides diagnostic information about the present operating conditions. The transceiver generates this diagnostic data by digitization of internal analog signals. Calibration and alarm/warning threshold data is written during device manufacture. Received power monitoring, transmitted power monitoring, bias current monitoring, supply voltage monitoring and temperature monitoring all are implemented. If the module is defined as external calibrated, the diagnostic data are raw A/D values and must be converted to real world units using calibration constants stored in EEPROM locations 56 to 95 at wire serial bus address A2h. The digital diagnostic memory map specific data field define as following. For detail EEPROM information please refer to the related document of SFF8472 Rev 10.2.

Specifications

Absolute Maximum Ratings

Parameter	Symbol	Min.	Max.	Unit
Storage Temperature	T_s	-40	+85	°C
Maximum Supply Voltage	V_{cc}	-0.5	3.6	V
Operating Relative Humidity	RH	5	85	%

Recommended Operating Conditions

Parameter	Symbol	Min.	Typ.	Max.	Unit
Operating Case Temperature	T_c	0		70	°C
Power Supply Voltage	V_{cc}	3.15	3.3	3.45	V
Power Supply Current	I_{cc}			300	mA

Optical Characteristics

Parameter	Symbol	Min.	Typ.	Max.	Unit
9µm Core Diameter SMF	L		20		km
Data Rate			2.5		Gbps
Power Budget			13		dB
Transmitter					
Center Wavelength	λ_C	1260	1310	1360	nm
Spectral Width (-20dB)	$\Delta\lambda$			1	nm
Side Mode Suppression Ratio	SMSR	30			dB
Average Output Power[Note1]	Pout	-5		0	dBm
Extinction Ratio[Note2]	ER	8.2			dB
Rise/Fall Time (20% ~ 80%)	tr/tf			150	ps
Total Jitter[Note2]	TJ			0.07	UI
Output Optical Eye	ITU-T G.957 Compliant				
Pout@TX Disable Asserted	Pout			-45	dBm
Receiver					
Center Wavelength	λ_C	1260		1600	nm
Receiver Sensitivity[Note3]	Pmin			-18	dBm
Receiver Overload	Pmax	-3			dBm
LOS De-Assert	LOSD			-19	dBm
LOS Assert	LOSA	-35			dBm
LOS Hysteresis		0.5			dB

Notes:

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

2. Filtered, measured with a PRBS 223-1 test pattern @2.5Gbps.

3. Minimum average optical power is measured at BER less than 1E-12, with 223-1 PRBS and ER=8.2dB

Electrical Characteristics

Parameter		Symbol	Min.	Typ.	Max.	Unit	Note
Transmitter							
LVPECL Inputs (Differential)		Vin	400		1600	mVpp	AC Coupled Inputs*(Note1)
Input Impedance (Differential)		Zin	85	100	115	ohms	Rin > 100 kohms @ DC
TX_Dis	Disable		2		V_{cc}+0.3	V	
	Enable		0		0.8		
TX_FAULT	Fault		2		V_{cc}+0.3	V	
	Normal		0		0.5		
Receiver							
LVPECL Outputs (Differential)		Vout	400	800	1200	mVpp	AC Coupled Outputs*(Note1)
Output Impedance (Differential)		Zout	85	100	115	ohms	
TX_Disable Assert Time		t_off			10	us	
RX_LOS	LOS		2		V_{cc}+0.3		
	Normal		0		0.8		
MOD_DEF (0.2)		VoH	2.5			V	With Serial ID
		VoL	0		0.5		

Note:

1. LVPECL logic, internally AC coupled.

Digital Diagnostic Functions

Parameter	Range	Unit	Accuracy	Calibration
Temperature	0 to 70	°C	±3°C	Internal / External
Voltage	3.0 to 3.6	V	±3%	Internal / External
Bias Current	0 to 70	mA	±10%	Internal / External
TX Power	-5 to 0	dBm	±3dB	Internal / External
RX Power	-18 to -3	dBm	±3dB	Internal / External

Ordering Information

Product Name	Product Description
SFP-2G-LP-31-10	SFP Plug-in, 2.5Gbps, 10km, TX=1310/RX wide, on two single mode fibres, LC/PC

Contact Information

Ascent Communication Technology Ltd

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

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

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

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

USA
2710 Thomes Ave
Cheyenne, WY 82001, USA
Phone: + 1 203 350 9822

VIETNAM
11th Floor, Hoa Binh Office Tower
106 Hoang Quoc Viet Street, Nghia Do Ward
Cau Giay District, Hanoi 10649, VIETNAM
Phone: +84-24-37955917

WEB: www.ascentcomtec.com

EMAIL: sales@ascentcomtec.com