

## OS-SP12-3120D

### SMF 1310nm 1.25Gbps Transceiver Data Sheet

## Features

- Operating Data Rate up to 1.25Gbps
- 20km with 9/125  $\mu$ m SMF
- Single 3.3V Power Supply
- Hot-Pluggable SFP Footprint Duplex LC Connector Interface
- Class 1 FDA and IEC60825-1 Laser Safety Compliant
- Operating Temperature:  
Standard: 0°C~+70°C  
Industrial:-40°C~+85°C
- Compliant with MSA SFP Specification
- Compliant with SFF-8472
- ROHS 2.0 compatible



## Applications

- Gigabit Ethernet Switches and Routers
- Fiber Channel Switch Infrastructure
- Other Optical Links

## Absolute Maximum Ratings

Parameter	Symbol	Min.	Max.	Unit
Storage Temperature	TS	-40	+85	°C
Maximum Supply Voltage	VCC	-0.5	3.6	V
Operating Relative Humidity	RH	5	85	%

\*Exceeding any one of these values may destroy the device immediately!

## Recommended Operating Conditions

Parameter	Symbol	Min.	Typ.	Max.	Unit
Operating Case Temperature	Tc	OS-SP12-3120D	0	+70	°C
		OS-SP12-3120DI	-40	+85	°C
Power Supply Voltage	Vcc	3.15	3.3	3.45	V
Power Supply Current	Icc			300	mA
Data Rate	GBE		1.25		Gbps
	FC		1.063		

## Performance Specifications – Electrical

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Parameter	Symbol	Min.	Typ.	Max.	Unit	Notes
Transmitter						
LVPECL Inputs(Differential)	Vin	400		2000	mVpp	AC Coupled Inputs*(Note1)
Input Impedance (Differential)	Zin	85	100	115	ohms	Rin > 100 kohms @ DC
TX_Dis	Disable	2		Vcc	V	
	Enable	0		0.8		
TX_FAULT	Fault	2		Vcc+0.3	V	
	Normal	0		0.5		
Receiver						
LVPECL Outputs (Differential)	Vout	400		2000	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		Vcc+0.3	V	
	Normal	0		0.8		
MOD_DEF(0.2)	VoH	2.5			V	With Serial ID
	VoL	0		0.5		

## Optical and Electrical Characteristics

Parameter	Symbol	Min.	Typ.	Max.	Unit
9μm Core Diameter SMF	L		20		km
Data Rate			1.063/1.25		Gbps
Transmitter					
Center Wavelength	$\lambda_c$	1260	1310	1360	nm
Spectral Width (RMS)	$\Delta\lambda$			4	nm
Average Output Power*(Note2)	Pout	-8		-3	dBm
Extinction Ratio*(Note3)	ER	9			dB
Rise/Fall Time(20% ~ 80%)	tr/ff			0.26	ns
Total Jitter*(Note3)	TJ			0.43	UI
Output Optical Eye	Compliant with IEEE 802.3				
Pout@TX Disable Asserted	Pout			-45	dBm
Receiver					
Center Wavelength	$\lambda_c$	1260		1600	nm
Receiver Sensitivity*(Note4)	Pmin			-22	dBm
Receiver Overload	Pmax	-3			dBm

LOS De-Assert	LOSD		-23	dBm
LOS Assert	LOSA	-36		dBm
LOS Hysteresis		1		dB

Note1: LVPECL logic, internally AC coupled

Note2: Output power is measured by coupling into a 9/125 mm single-mode fiber.

Note3: Filtered, measured with a PRBS 2<sup>7</sup>-1 test pattern @1250Mbps.

Note4: Minimum average optical power is measured at BER less than 1E-12, with 2<sup>7</sup>-1 PRBS and ER=9 dB

## Regulatory Compliance

Feature	Standard	Performance
Electrostatic Discharge (ESD) to the Electrical Pins	MIL-STD-883G Method 3015.7	Class 1C (>1000V)
Electrostatic Discharge (ESD) to the enclosure	EN 55035:2017/A11:2020 IEC-61000-4-2 GR-1089-CORE	Compliant with standards
Electromagnetic Interference (EMI)	FCC 47CFR Part 15 Class B EN55032:2015+A11:2020 CISPR 16-2-1	Compliant with standards Noise frequency range: 30MHz to 6GHz. Good system EMI design practice required to achieve Class B margins. System margins are dependent on customer host board and chassis design.
RoHS 10	2011/65/EU and the amendment directive (EU) 2015/863	Compliant with standards
Component Recognition	EN 60950-1:2006+A11+A1+A12+A2 EN 60825-1:2007 EN60825-2:2004+A1+A2	CE No.: CTB210720006EX-ZS UL file: CN2069TD 001 TüV Certificate No. CU 72210053 01

Note5: For update of the equipments and strict control of raw materials, OUSENT has the ability to supply the customized products since Jan 1, 2007, which meet the requirements of RoHS6 (Restrictions on use of certain Hazardous Substances) of European Union. In light of item 5 in RoHS exemption list of RoHS Directive 2002/95/EC, Item 5: Lead in glass of cathode ray tubes, electronic components and fluorescent tubes. In light of item 13 in RoHS exemption list of RoHS Directive 2005/747/EC, Item13: Lead and cadmium in optical and filter glass. The three exemptions are being concerned for Ousent's transceivers, because Ousent's transceivers use glass, which may contain Pb, for components such as lenses, windows, isolators, and other electronic components.

### Laser Safety:

All transceivers are Class 1 Laser products per FDA/CDRH and IEC-60825 standards. They must be operated under specified operating conditions

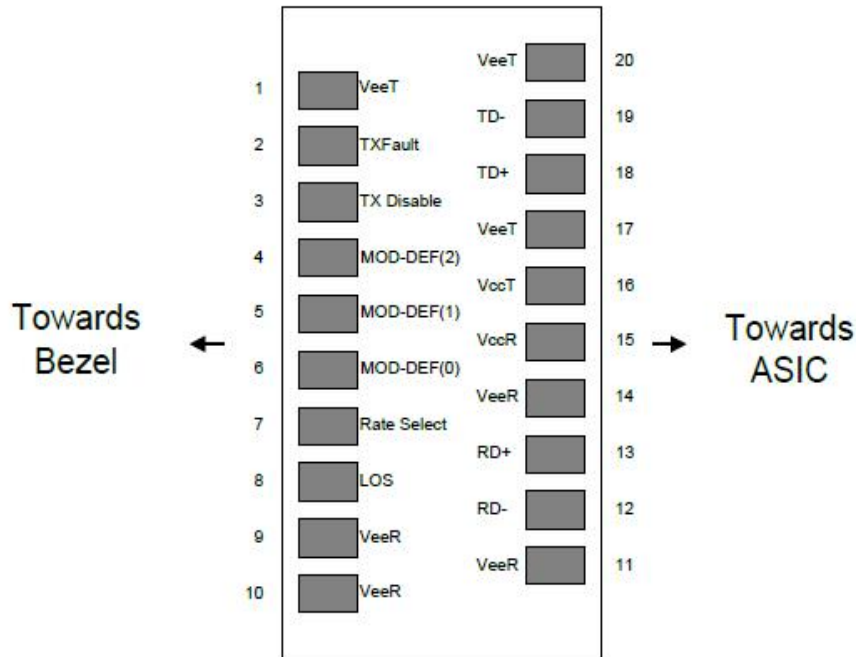


**Ousent Technologies Co., Ltd**

NAME OF MANUFACTURE:

This product complies with  
21 CFR 1040. 10 and 1040. 11  
Meet Class 1 Laser Safety Requirements

## Electrical Pin-out Details



## Pin Function Definitions

Pin	Name	Function	Plug Seq.	Notes
1	VeeT	Transmitter Ground	1	5)
2	TX Fault	Transmitter Fault Indication	3	1)
3	TX Disable	Transmitter Disable	3	2) Module disables on high or open
4	MOD-DEF2	Module Definition 2	3	3) 2 wire serial ID interface.
5	MOD-DEF1	Module Definition 1	3	3) 2 wire serial ID interface.
6	MOD-DEF0	Module Definition 0	3	3) Grounded within the module.
7	Rate Select	Not Connect	3	Function not available
8	LOS	Loss of Signal	3	4)
9	VeeR	Receiver Ground	1	5)
10	VeeR	Receiver Ground	1	5)
11	VeeR	Receiver Ground	1	5)
12	RD-	Inv. Received Data Out	3	6)
13	RD+	Received Data Out	3	7)
14	VeeR	Receiver Ground	1	5)
15	VccR	Receiver Power	2	7) 3.3 ± 5%
16	VccT	Transmitter Power	2	7) 3.3 ± 5%
17	VeeT	Transmitter Ground	1	5)
18	TD+	Transmit Data In	3	8)
19	TD-	Inv. Transmit Data In	3	8)
20	VeeT	Transmitter Ground	1	5)

## NOTES:

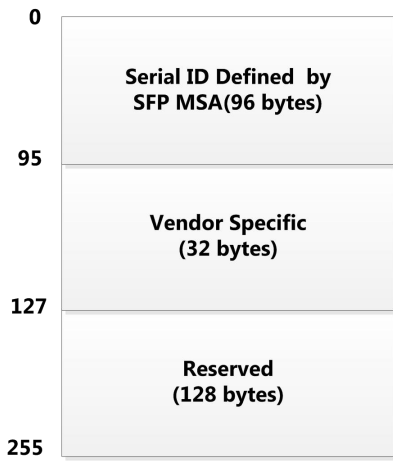
- 1) TX Fault is an open collector/drain output, which should be pulled up with a 4.7K–10K resistor on the host board. Pull up voltage between 2.0V and  $V_{ccT}/R+0.3V$ . When high, output indicates a laser fault of some kind. Low indicates normal operation. In the low state, the output will be pulled 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 – 10 K 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  $V_{ccT}$  or  $V_{ccR}$ .
  - 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  $V_{ccT}/R+0.3V$ . 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)  $V_{eeR}$  and  $V_{eeT}$  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 2000 mV differential (200 –1000 mV single ended) when properly terminated.
- 7)  $V_{ccR}$  and  $V_{ccT}$  are the receiver and transmitter power supplies. They are defined as  $3.3V\pm5\%$  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 inrush current of no more than 30mA greater than the steady state value.  $V_{ccR}$  and  $V_{ccT}$  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

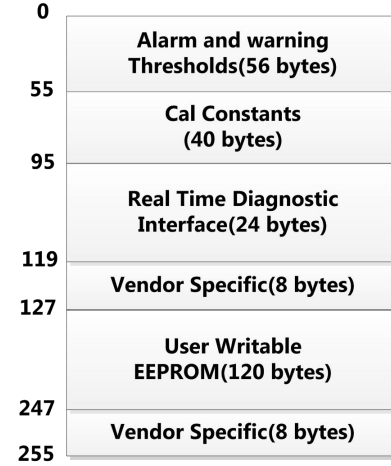
The serial interface uses the 2-wire serial CMOS EEPROM protocol defined for the ATMEL AT24c02/04 family of components. When the serial protocol is activated, the host generates the serial clock signal (SCL). The positive edge clocks data into those segments of the EEPROM that are not write protected 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 – 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.

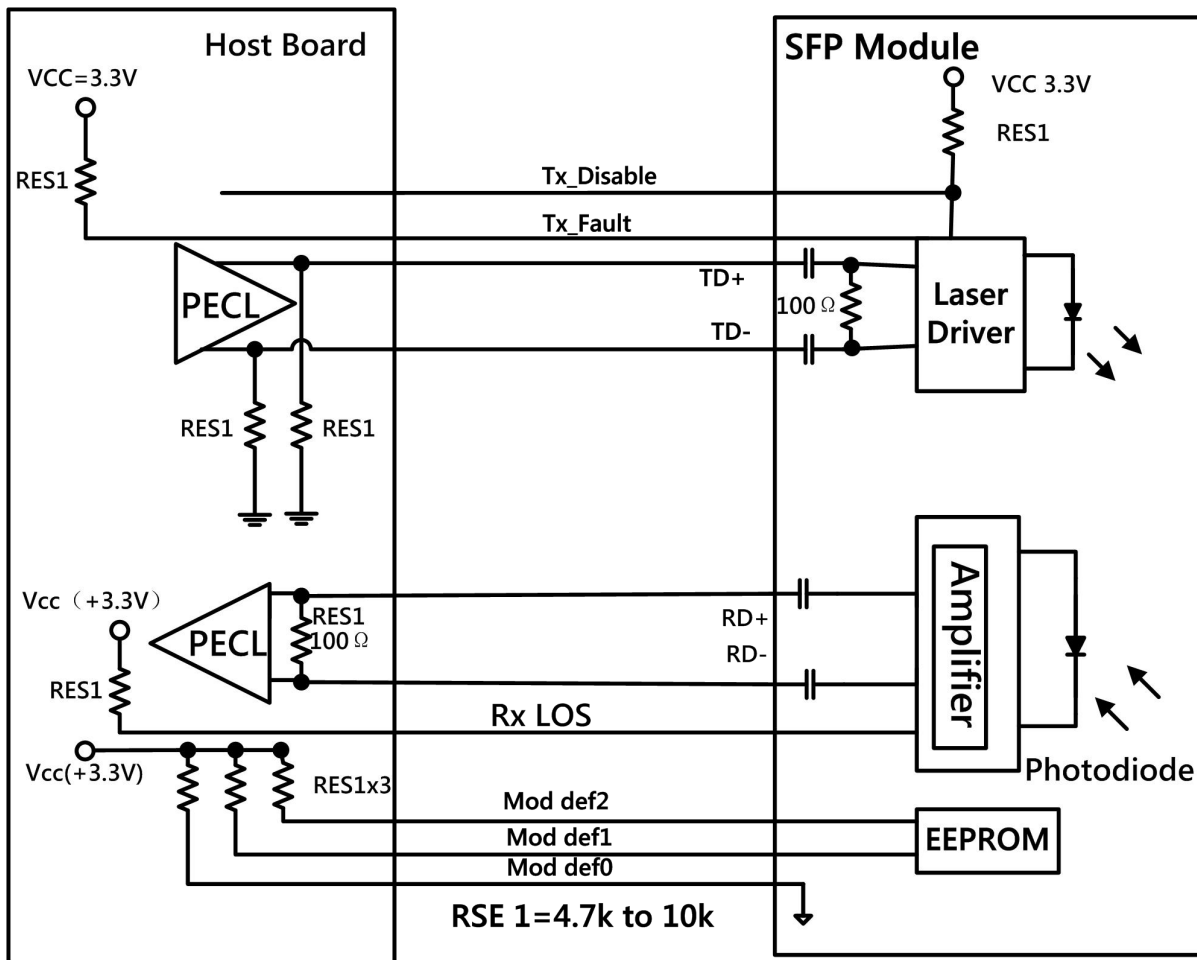
2 wire address 1010000X(A0h)



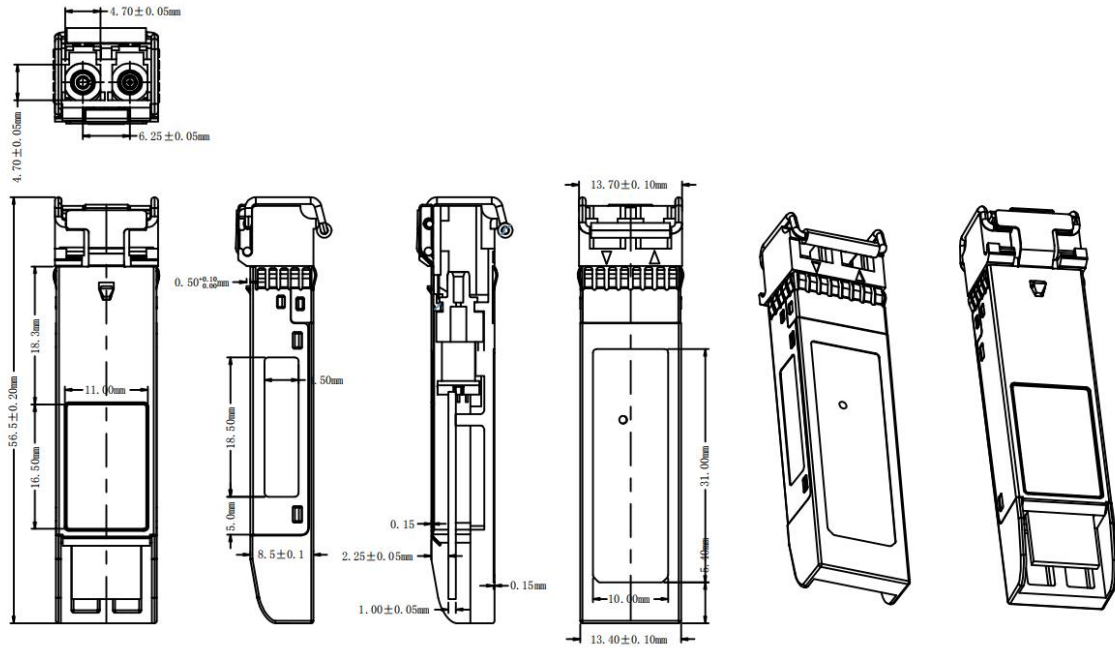
2 wire address 1010000X (A2h)



### Recommend Circuit Schematic



## Mechanical Specifications



## Order Information

Part No.	Data Rate	Fiber	Distance	Interface	Temp.	DDMI
OS-SP12-3120D	1.25Gbps	SMF	20km	LC	0°C~70°C	Yes
OS-SP12-3120DI	1.25Gbps	SMF	20km	LC	-40°C~85°C	Yes

### Notice:

Ousent reserves the right to make changes to or discontinue any optical link product or service identified in this publication without notice in order to improve design and or performance.

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