

# Mini-GBIC (SFP)

## Tx1270nm/1330nm DFB, WDM, 10GBase SFP+ Transceiver

- Distance: 10km, 20km, 40km
- Standard Operating Temperature: 0°C ~ 70°C
- Wide Operating Temperature: -40°C ~ 85°C



### OVERVIEW

Lantech 10GBase Small Form Factor Pluggable SFP+ transceivers are compliant with the current SFP+ Multi-Source Agreement (MSA) Specification. The high performance

1270nm/1330nm DFB transmitter and high sensitive PIN receiver provide superior performance for 10GBase Ethernet applications up to 40km optical links.

### FEATURES & BENEFITS

- Compliant with IEEE802.3ae 10GBase-BX Ethernet Standard
- Compatible with IEEE802.3ae 10GBase-LR/LW Ethernet Standard
- Compliant with SFP8472 diagnostic monitoring interface
- Compliant with SFP+ MSA
- Hot Pluggable
- 1270nm/1330nm DFB laser transmitter
- Simplex LC connector
- 2-wire interface for management and diagnostic monitor
- Single +3.3V power supply voltage
- Transmission distance of 10/20/40KM over single mode fiber
- RoHS Compliant

### SPECIFICATION

#### Absolute Maximum Ratings

Parameter	Symbol	Min.	Max.	Unit	Note
Storage Temperature	T <sub>ST</sub>	-40	+85	°C	
Supply Voltage	V <sub>CC</sub>	-0.5	+4.0	V	
Storage Relative Humidity	RH	5	95	%	

#### Recommended Operating Conditions

Parameter	Symbol	Min.	Typ.	Max.	Unit	Note
Case Operating Temperature	T <sub>OP</sub>	0		+70	°C	Standard model
Case Operating Temperature	T <sub>OP</sub>	-40		+85	°C	-E model
Supply Voltage	V <sub>CC</sub>	+3.1	+3.3	+3.5	V	
Supply Current	I <sub>CC</sub>			300	mA	10KM, 20KM
Supply Current	I <sub>CC</sub>			320	mA	40KM

#### Transmitter Electro-Optical Interface

V<sub>CC</sub>=3.1V to 3.5V, T<sub>OP</sub>= 0°C to 70°C (Standard model); T<sub>OP</sub>= -40°C to 85°C (-E model)

Parameter	Symbol	Min.	Typ.	Max.	Unit	Note	
Operating Data Rate	DR	9.953	10.3125	11.3	Gb/s		
Bit Error Rate	BER			10 <sup>-12</sup>			
Optical Launch Power	P <sub>o</sub>	1270nm 10km	-6		+1	dBm	1
		1330nm 10km	-6		+1		
		1270nm 20km	-2		+3		
		1330nm 20km	-2		+3		
		1270nm 40km	+0.5		+5		
		1330nm 40km	+0.5		+5		
Center		1260	1270	1280	nm		

Datasheet Version 1.2

Wavelength h	1330nm	10km		1320	1330	1340		
	1270nm	20km		1260	1270	1280		
	1330nm	20km		1320	1330	1340		
	1270nm	40km		1260	1270	1280		
	1330nm	40km		1320	1330	1340		
Spectral Width (-20dB)			$\Delta\lambda$			1	nm	
Side Mode Suppression Ratio			SMSR	30			dB	
Optical Extinction Ratio			ER	3.5			dB	
Dispersion Penalty			DP			3.2	dB	
Average Launch Power of OFF Transmitter			P <sub>OFF</sub>			-30	dBm	
Optical Eye Mask				IEEE802.3ae				
Relative Intensity Noise			RIN			-128	dB/Hz	
Differential Data Input Swing			V <sub>IN</sub>	180		850	mV	
Transmit Disable Input Voltage-Low (TX ON)			TDISV <sub>L</sub>	GND		0.8	V	
Transmit Disable Input Voltage-Low (TX OFF)			TDISV <sub>H</sub>	2.0		V <sub>CC</sub>	V	
Transmit Fault Output Voltage-Low (TX Normal)			TFLT <sub>V<sub>L</sub></sub>	GND		0.8	V	
Transmit Fault Output Voltage-Low (TX Fault)			TFLT <sub>V<sub>H</sub></sub>	2.0		V <sub>CC</sub>	V	

Notes: 1. The optical power is launched into a 9/125µm single-mode fiber.

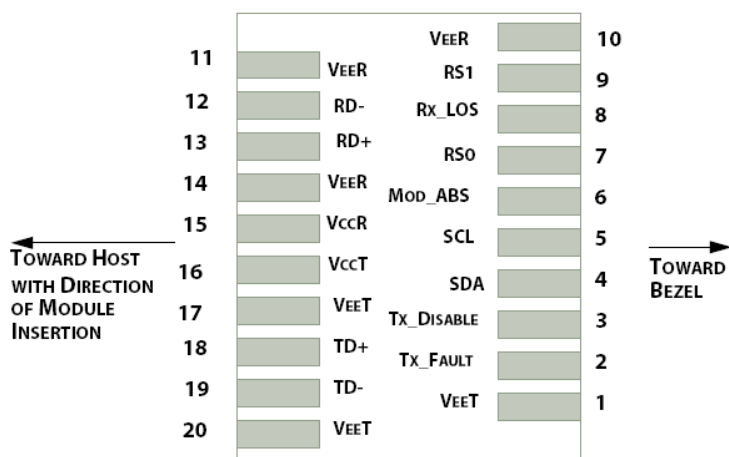
**Receiver Electro-Optical Interface**

V<sub>CC</sub>=3.15V to 3.46V, T<sub>OP</sub>= 0°C to 70°C (Standard model); T<sub>OP</sub>= -40°C to 85°C (-E model)

Parameter		Symbol	Min.	Typ.	Max.	Unit	Note
Operating Data Rate		DR	9.953	10.3125	11.3	Gb/s	
Receiver Sensitivity	1270nm 10km	P <sub>IN_min</sub>			-14.4	dBm	1
	1330nm 10km				-14.4		
	1270nm 20km				-14.5		
	1330nm 20km				-14.5		
	1270nm 40km				-15.5		
Maximum Input Power		P <sub>IN_max</sub>			+0.5	dBm	1
Operating Center Wavelength h	1270nm 10km	λ <sub>c</sub>	1320	1330	1340	nm	
	1330nm 10km		1260	1270	1280		
	1270nm 20km		1320	1330	1340		
	1330nm 20km		1260	1270	1280		
	1270nm 40km		1320	1330	1340		
Receiver Reflectance		RR			-14	dB	
LOS De-Assert	1270nm 10km	LOS <sub>D</sub>			-15.5	dBm	
	1330nm 10km				-15.5		
	1270nm 20km				-15.5		
	1330nm 20km				-15.5		
	1270nm 40km				-16.5		
LOS Assert		LOS <sub>A</sub>	-30			dBm	
LOS Hysteresis		LOS <sub>V<sub>HY</sub></sub>	0.5			dB	
Differential Data Output Swing		V <sub>OUT</sub>	300		900	mV	
Receiver LOS Signal Output Voltage-Low		LOS <sub>V<sub>L</sub></sub>	V <sub>EE</sub>		0.5	V	
Receiver LOS Signal Output Voltage-High		LOS <sub>V<sub>H</sub></sub>	2.4		V <sub>CC</sub>	V	

Notes: 1. Measured with a PRBS 2<sup>31</sup>-1 test pattern @ 10.3125Gbps BER <10<sup>-12</sup>

### Pin Assignment



Host PCB SFP+ pad assignment top view

### Pin Description

Pin	Name	Function / Description
1	VeeT	Transmitter Ground
2	TX_Fault	Transmitter Fault Indication (1)
3	TX_Disable	Transmission Disable – Module disables on high or open (2)
4	SDA	2-wire Serial Interface Data Line (SDA: Serial Data Signal) (3)
5	SCL	2-wire Serial Interface Clock (SCL: Serial Clock Signal) (3)
6	Mod_ABS	Module Absent, connected to VeeT or VeeR in the module (3)
7	RS0	Rate Select 0, optionally controls SFP+ module receiver (5)
8	Rx_LOS	Receiver Loss of Signal Indication (4)
9	RS1	Rate Select 1, optionally controls SFP+ module transmitter (5)
10	VeeR	Receiver Ground
11	VeeR	Receiver Ground
12	RD-	Inverse Received Data output, Differential LVPECL, AC coupled
13	RD+	Receiver Non-Inverted Data output, Differential LVPECL, AC coupled
14	VeeR	Receiver Ground
15	VccR	Receiver 3.3V Power Supply
16	VccT	Transmitter 3.3V Power Supply
17	VeeT	Transmitter Ground
18	TD+	Transmitter Non-Inverted Data Input, Differential LVPECL, AC coupled
19	TD-	Transmitter Inverted Data Input, Differential LVPECL, AC coupled
20	VeeT	Transmitter Ground

**Note1:** TX Fault is open collector/drain output which should be pulled up externally with a 4.7K~ 10KΩ resistor on the host board to supply <VccT+0.3V or VccR+0.3V. When high, this output indicates a laser fault of some kind. Low indicates normal operation. In the low state, the output will be pulled to <0.8V.

**Note2:** TX Disable input is used to shut down the laser output per the state table below. It is pulled up within the module with a 4.7K~10KΩ resistor.

1)Low(0~0.8V): Transmitter on; 2)Between(0.8V and 2V): Undefined; 3)High (2.0~ VccT): Transmitter Disabled; 4)Open: Transmitter Disabled

**Note3:** These are the module definition pins. They should be pulled up with a 4.7K~10KΩ resistor on the host board to supply less than VccT+0.3V or VccR+0.3V. Mod-ABS is grounded by the module to indicate that the module is present.

**Note4:** LOS (Loss of signal) is an open collector/drain output which should be pulled up externally with a 4.7K~10KΩ resistor on the host board to supply <VccT+0.3V or VccR+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.

**Note5:** No connect on this module.

## Digital Diagnostic Functions

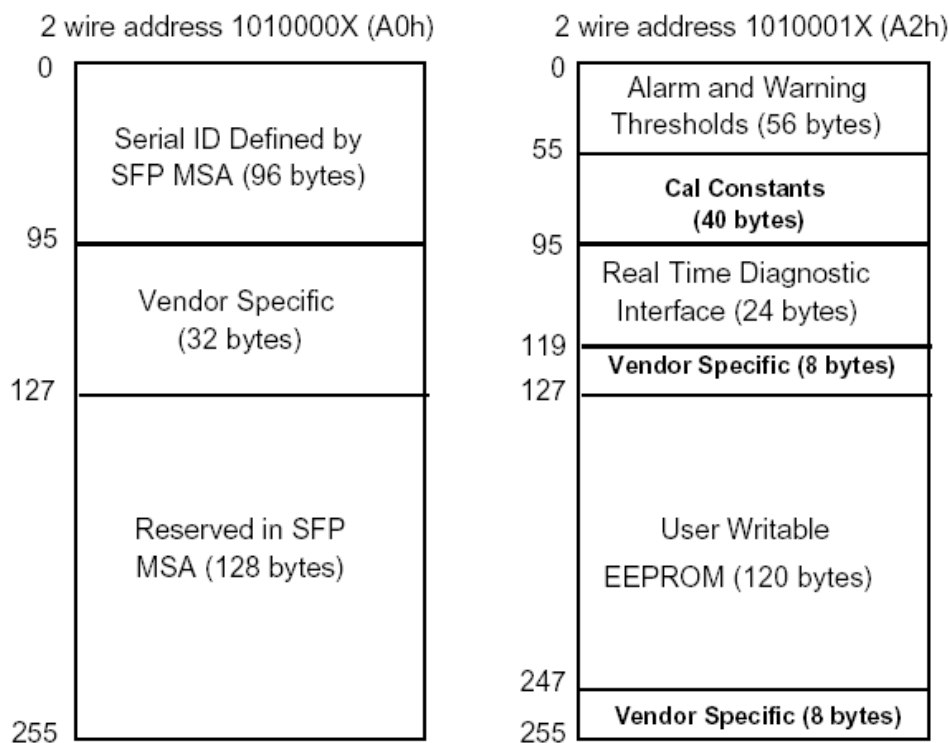
As defined by the SFP MSA (SFF-8472) Lantech's SFP transceivers provide digital diagnostic functions via a 2-wire serial interface, which allows real-time access to the following operating parameters:

- Transceiver temperature
- Laser bias current
- Transmitted optical power
- Received optical power
- Transceiver supply voltage

It also provides a sophisticated system of alarm and warning flags, which may be used to alert end-users when particular operating parameters are outside of a factory-set normal range.

The operating and diagnostics information is monitored and reported by a Digital Diagnostics Controller (DDC) inside the transceiver, which is accessed through the 2-wire serial interface. When the serial protocol is activated, the serial clock signal (SCL pin) is generated by the host. The positive edge clocks data into the SFP transceiver into those segments of its memory map that are not write-protected. The negative edge clocks data from the SFP transceiver. The serial data signal (SDA pin) 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.

## Digital Diagnostic Memory Map



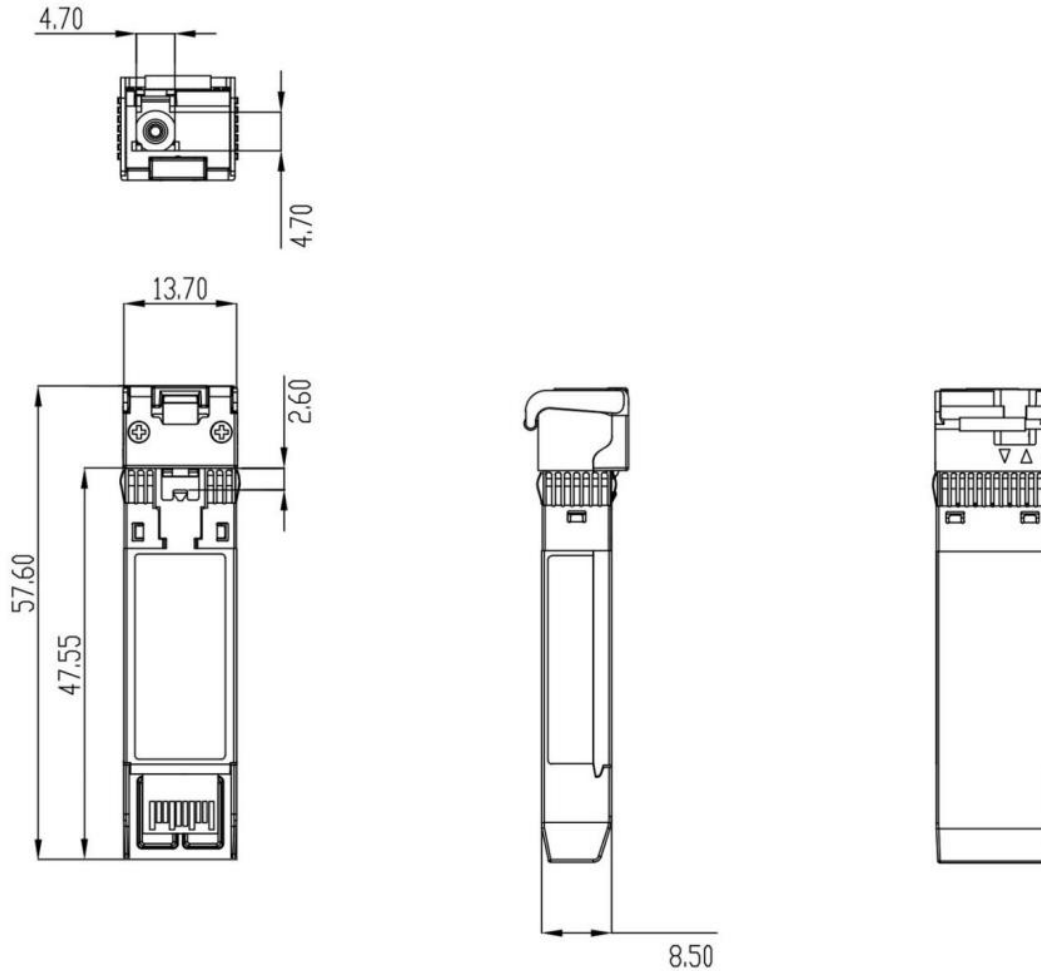
## Digital Diagnostic Monitoring Characteristics

Parameter	Accuracy	Unit	Note
Temperature	±3	°C	
Supply Voltage	±0.1	V	
TX Bias Current	±5	mA	

TX Output Power	±3	dB	
RX Received Optical Power	±3	dB	

**DIMENSIONS (unit=mm)**

\*All dimensions are ±0.2mm unless otherwise specified



**ORDERING INFORMATION**

Part Number	TX	RX	Link	DDM	Mode	Temp.
8330-209D-V1	1270nm	1330nm	10km	Yes	Single-mode	0~70°C
8330-209DE-V1	1270nm	1330nm	10km	Yes	Single-mode	-40~85°C
8330-210D-V1	1330nm	1270nm	10km	Yes	Single-mode	0~70°C
8330-210DE-V1	1330nm	1270nm	10km	Yes	Single-mode	-40~85°C
8330-200D-V1	1270nm	1330nm	20km	Yes	Single-mode	0~70°C
8330-200DE-V1	1270nm	1330nm	20km	Yes	Single-mode	-40~85°C
8330-201D-V1	1330nm	1270nm	20km	Yes	Single-mode	0~70°C
8330-201DE-V1	1330nm	1270nm	20km	Yes	Single-mode	-40~85°C
8330-202D-V1	1270nm	1330nm	40km	Yes	Single-mode	0~70°C
8330-202DE-V1	1270nm	1330nm	40km	Yes	Single-mode	-40~85°C
8330-203D-V1	1330nm	1270nm	40km	Yes	Single-mode	0~70°C
8330-203DE-V1	1330nm	1270nm	40km	Yes	Single-mode	-40~85°C

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