

# Mini-GBIC (SFP)

## 10G SFP+ LR Transceiver

- Hot Pluggable, Duplex LC, 1310nm DFB-LD, Single Mode, DDM
- Distance: 20KM
- Standard Operating Temperature: 0°C ~ 70°C
- Wide Operating Temperature: -40°C ~ 85°C



### OVERVIEW

10GBase SFP+ LR Small Form Factor Pluggable SFP+ transceivers are compliant with the current SFP+ Multi-Source Agreement (MSA) Specification. The high performance uncooled 1310nm DFB

transmitter and high sensitivity PIN receiver provide superior performance for 10GBASE-LR/LW applications up to SMF 20km optical links.

### FEATURES & BENEFITS

- Compliant with IEEE802.3ae 10GBASE-LR/LW
- Compliant with CPRI Option 7, 8
- Compliant with SFF-8431 SFP+ MSA
- Support 8.5Gb/s to 11.32Gb/s Multi-Rate
- Hot Pluggable
- 1310nm DFB laser transmitter
- Duplex LC connector
- 2-wire interface for management and diagnostic monitor compliant with SFF-8472
- Single +3.3V power supply
- Link distance 20km over SM fiber
- RoHS Compliant

### SPECIFICATION

#### Absolute Maximum Ratings

Parameter	Symbol	Min.	Max.	Unit	Note
Storage Temperature	Ts	-40	+85	°C	
Supply Voltage	Vcc	-0.5	+4.0	V	
Storage Relative Humidity	RH	5	95	%	

#### Recommended Operating Conditions

Parameter	Symbol	Min.	Typ.	Max.	Unit	Note
Case Operating Temperature	Top	0		+70	°C	
Case Operating Temperature (-E model)	Top	-40		+85	°C	
Supply Voltage	Vcc	+3.13	+3.3	+3.47	V	
Supply Current	Icc			320	mA	
Supply Current (-E model)	Icc			350	mA	

## Transmitter Electro-Optical Interface

V<sub>CC</sub>= 3.13V to 3.47V, T<sub>OP</sub> = 0 °C to 70 °C (standard model); T<sub>OP</sub> = -40 °C to 85 °C (-E model)

Parameters	Symbol	Min.	Typ.	Max.	Unit	Note
Operating Date Rate	DR	8.5	10.3125	11.32	Gb/s	
Optical Launch Power	P <sub>o</sub>	-4		+0.5	dBm	1
Optical Center Wavelength	λ <sub>c</sub>	1260	1310	1355	nm	
Spectral Width (-20dB)	Δλ			1	nm	
Side Mode Suppression Ratio	SMSR	30			dB	
Optical Extinction Ratio	ER	3.5			dB	
Optical Eye Mask		IEEE802.3ae				
Relative Intensity Noise	RIN			-128	dB/Hz	
Differential Data Input Swing	V <sub>IN</sub>	180		850	mV	
TX Disable Input Voltage-Low (TX ON)	TDISV <sub>L</sub>	GND		0.8	V	
TX Disable Input Voltage-High (TX OFF)	TDISV <sub>H</sub>	2.0		V <sub>CC</sub>	V	
TX Fault Output Voltage-Low (TX Normal)	TFLT <sub>V<sub>L</sub></sub>	GND		0.8	V	
TX Fault Output Voltage-High (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

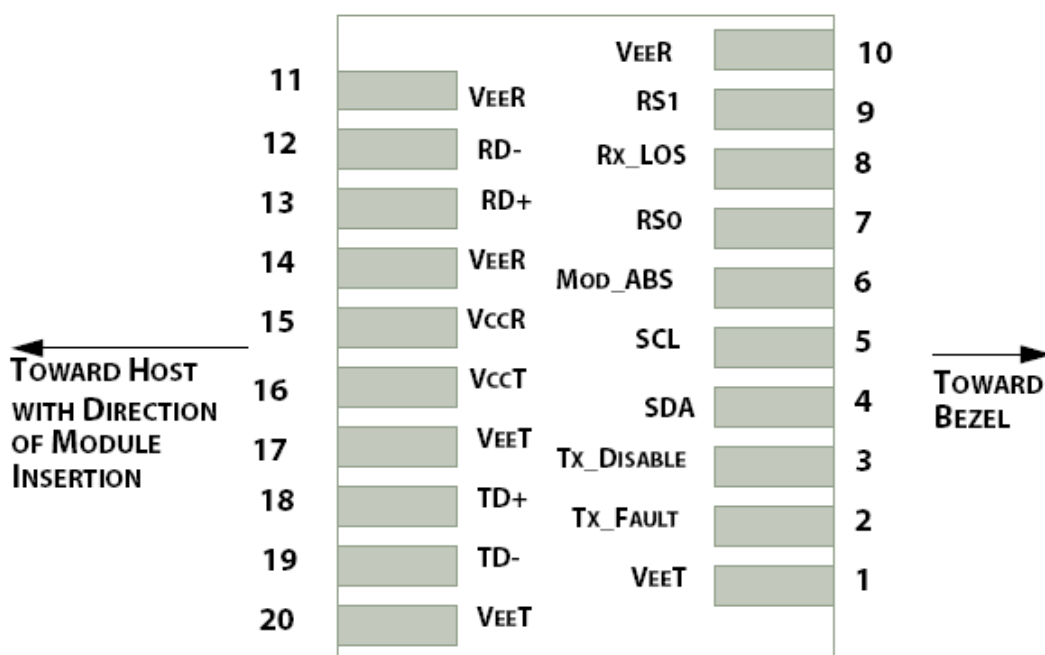
## Receiver Electro-Optical Interface

V<sub>CC</sub>= 3.13V to 3.47V, T<sub>OP</sub> = 0 °C to 70 °C (standard model); T<sub>OP</sub> = -40 °C to 85 °C (-E model)

Parameters	Symbol	Min.	Typ.	Max.	Unit	Note
Operating Date Rate	DR	8.5	10.3125	11.32	Gb/s	
Receiver Sensitivity	PIN <sub>min</sub>			-15	dBm	1
Maximum Input Power	PIN <sub>max</sub>	+0.5			dBm	1
Optical Center Wavelength	λ <sub>C</sub>	1260		1620	nm	
LOS De-Assert	LOS <sub>D</sub>			-16	dBm	
LOS Assert	LOS <sub>A</sub>	-30			dBm	
LOS Hysteresis	LOS <sub>HY</sub>	0.5			dB	
Differential data output voltage	V <sub>out</sub>	300		900	mV	
Receiver LOS Signal Output Voltage-Low	LOS <sub>V<sub>L</sub></sub>	GND		0.8	V	
Receiver LOS Signal Output Voltage-High	LOS <sub>V<sub>H</sub></sub>	2.0		V <sub>CC</sub>	V	

**Note1:** 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	Transmitter Disable – Turns off transmitter laser output (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-	Receiver Inverted 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 <math>V\_{ccT}+0.3V</math> or <math>V\_{ccR}+0.3V</math>. 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 <math><0.8V</math>.

- 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

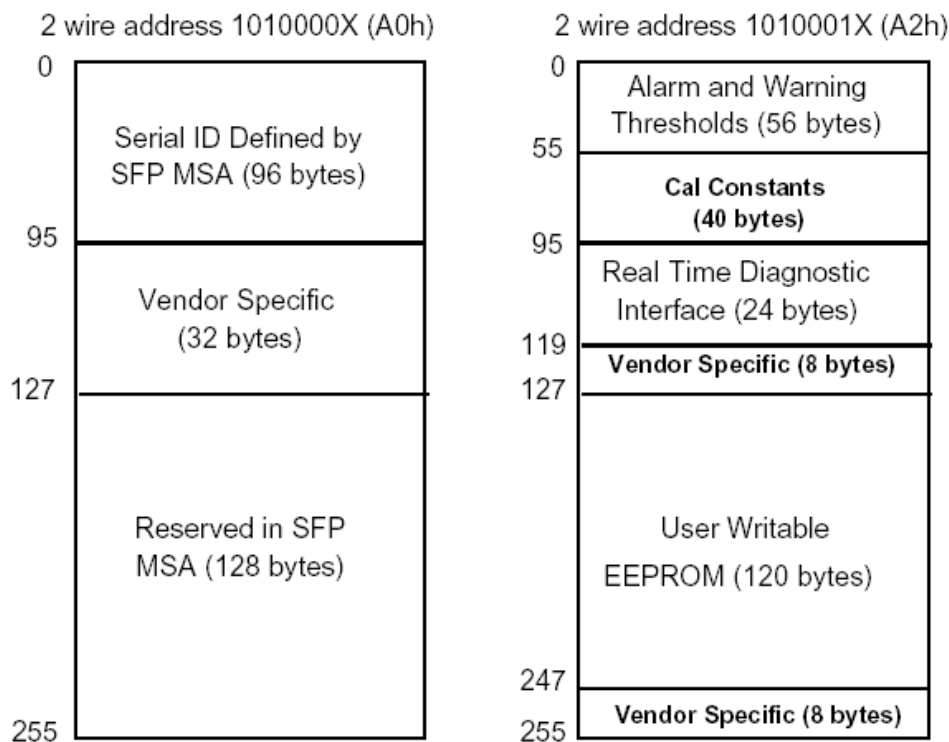
As defined by the SFP MSA (SFF-8472) Lantech's SFP transceivers provide digital diagnostic functions via a 2-wire serial interface, which allows real-time access to the following operating parameters:

- 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.

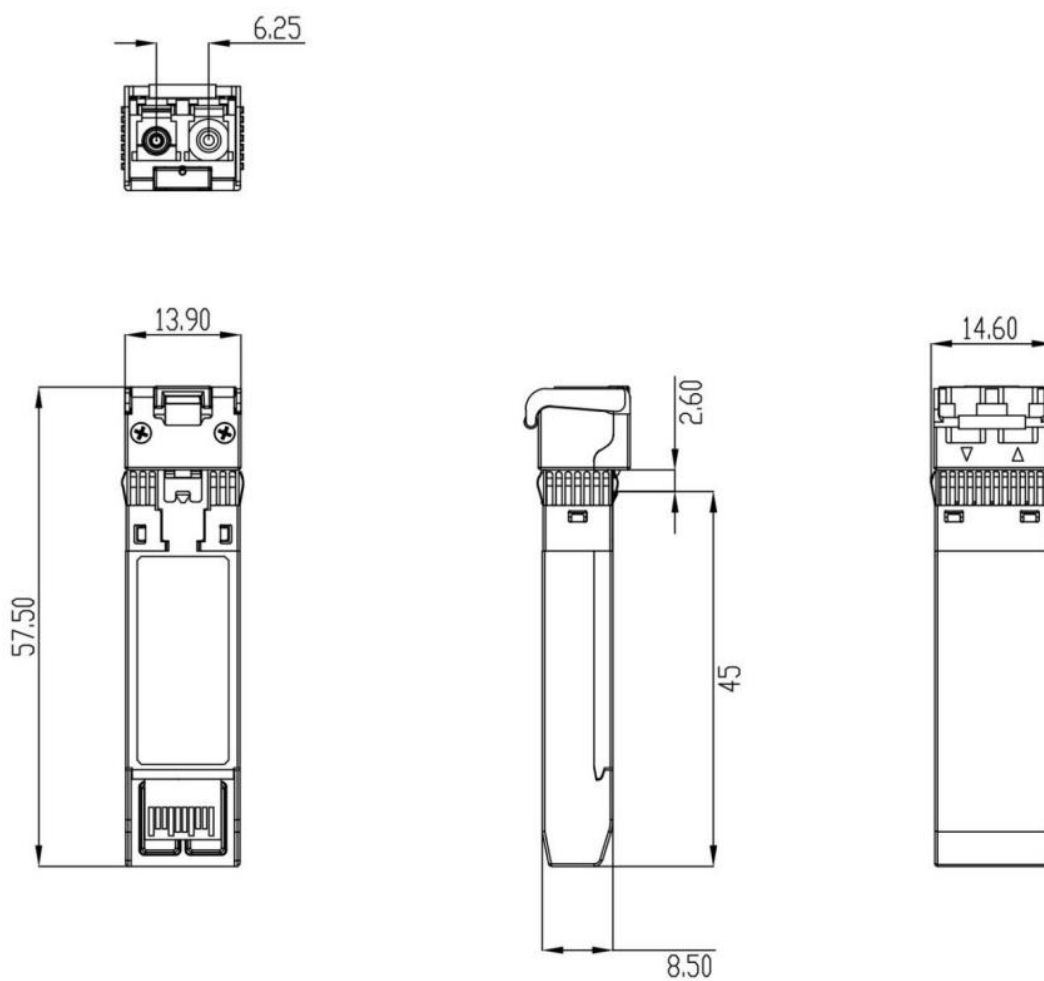
## Digital Diagnostic Memory Map



**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	

**Mechanical Dimensions**



(All Dimensions are ±0.20mm Unless Otherwise Specified, Unit: mm)

Part Number	TX	RX	Link	DDM	Mode	Temp.
8330-223D-V1	1310nm	1260nm~1620nm	20km	Yes	Single-mode	0~70°C
8330-223DE-V1	1310nm	1260nm~1620nm	20km	Yes	Single-mode	-40~85°C

**NOTE:** Distances are indicative only. To calculate a more precise link budget based on specific conditions in your application, please refer to the optical characteristics.

**Lantech Communications Global Inc.**

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