

# Mini-GBIC (SFP)

## 10G SFP+ LR (ER-1310/ER-1550) Transceiver

- Hot Pluggable, Duplex LC, 1310nm DFB/1550nm EML, Single Mode, DDM
- Distance: 40KM
- Standard Operating Temperature: 0°C ~ 70°C
- Wide Operating Temperature: -40°C ~ 85°C



### OVERVIEW

10GBase-LR/LW Small Form Factor Pluggable SFP+ transceivers are compliant with the current SFP+ Multi-Source Agreement (MSA) Specification. The high performance uncooled 1310nm DFB/1550nm

EML transmitter and high sensitivity PIN receiver provide superior performance for 10GBASE-LR/LW applications up to SMF 40km 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/1550nm EML laser transmitter
- Duplex LC connector
- 2-wire interface for management and diagnostic monitor compliant with SFF-8472
- Single +3.3V power supply
- Link distance 40km 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	%	
Operational Humidity	RH	0	85	%	

#### 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			350	mA	
Supply Current (-E model)	Icc			380	mA	

## Transmitter Electro-Optical Interface

$V_{CC} = 3.13V$  to  $3.47V$ ,  $T_{OP} = 0\text{ }^{\circ}C$  to  $70\text{ }^{\circ}C$  (standard model);  $T_{OP} = -40\text{ }^{\circ}C$  to  $85\text{ }^{\circ}C$  (-E model)

Parameters	Symbol	Min.	Typ.	Max.	Unit	Note
Operating Data Rate	DR	8.5	10.3125	11.32	Gb/s	
Optical Launch Power	$P_o$	0		+4	dBm	1
Optical Center Wavelength	$\lambda_c$	1260	1310	1355	nm	
Spectral Width (-20dB)	$\Delta\lambda$			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	$V_{IN}$	180		850	mV	
TX Disable Input Voltage-Low (TX ON)	$TDISV_L$	GND		0.8	V	
TX Disable Input Voltage-High (TX OFF)	$TDISV_H$	2.0		$V_{CC}$	V	
TX Fault Output Voltage-Low (TX Normal)	$TFLTV_L$	GND		0.8	V	
TX Fault Output Voltage-High (TX Fault)	$TFLTV_H$	2.0		$V_{CC}$	V	

**Notes:** 1. The optical power is launched into a 9/125 $\mu$ m single-mode fiber

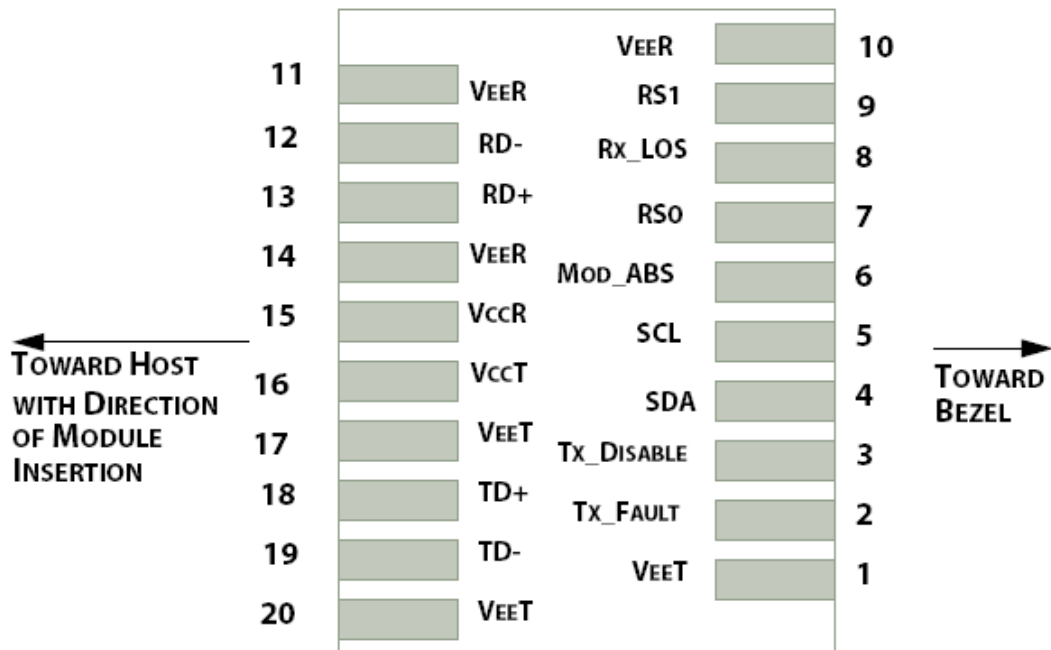
## Receiver Electro-Optical Interface

$V_{CC} = 3.13V$  to  $3.47V$ ,  $T_{OP} = 0\text{ }^{\circ}C$  to  $70\text{ }^{\circ}C$  (standard model);  $T_{OP} = -40\text{ }^{\circ}C$  to  $85\text{ }^{\circ}C$  (-E model)

Parameters	Symbol	Min.	Typ.	Max.	Unit	Note
Operating Data Rate	DR	8.5	10.3125	11.32	Gb/s	
Receiver Sensitivity	$PIN_{min}$			-16	dBm	1
Maximum Input Power	$PIN_{max}$	+0.5			dBm	1
Optical Center Wavelength	$\lambda_C$	1260		1620	nm	
LOS De-Assert	$LOS_D$			-17	dBm	
LOS Assert	$LOS_A$	-30			dBm	
LOS Hysteresis	$LOS_{HY}$	0.5			dB	
Differential data output voltage	$V_{out}$	300		900	mV	
Receiver LOS Signal Output Voltage-Low	$LOSV_L$	GND		0.8	V	
Receiver LOS Signal Output Voltage-High	$LOSV_H$	2.0		$V_{CC}$	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, optional (5)
8	Rx_LOS	Receiver Loss of Signal Indication (4)
9	RS1	Rate Select 1, optional (5)
10	VeeR	Receiver Ground
11	VeeR	Receiver Ground
12	RD-	Receiver Inverted Data output, AC coupled
13	RD+	Receiver Non-Inverted Data output, 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, AC coupled
19	TD-	Transmitter Inverted Data Input, 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  $<V_{ccT}+0.3V$  or  $V_{ccR}+0.3V$ . 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~  $V_{ccT}$ ): 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  $V_{ccT}+0.3V$  or  $V_{ccR}+0.3V$ . MOD\_ABS is grounded by the module to indicate that the module is present.

**Note4:** Rx\_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  $<V_{ccT}+0.3V$  or  $V_{ccR}+0.3V$ . 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:** Tied to ground through a 30K ohm resistor.

## 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:

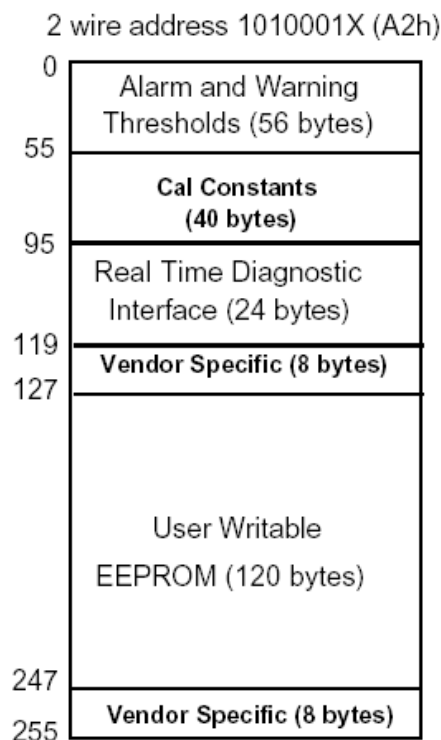
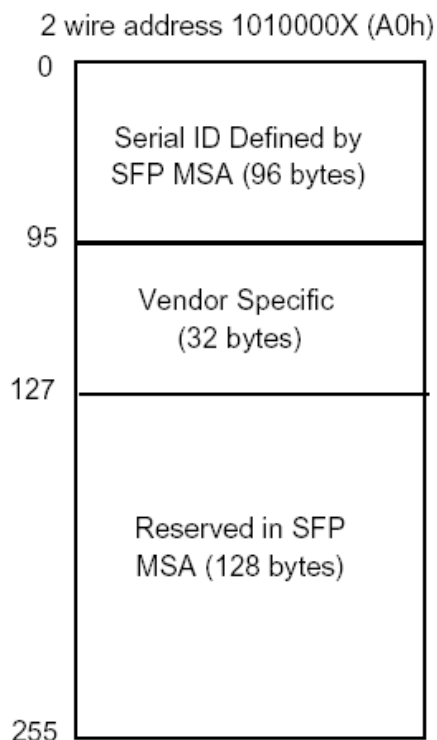
- Transceiver temperature
- Laser bias current
- Transmitted optical power
- Received optical power
- Transceiver supply voltage

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.

For more detailed information including memory map definitions, please see the SFP MSA (SFF-8472) Specification.

## Digital Diagnostic Memory Map

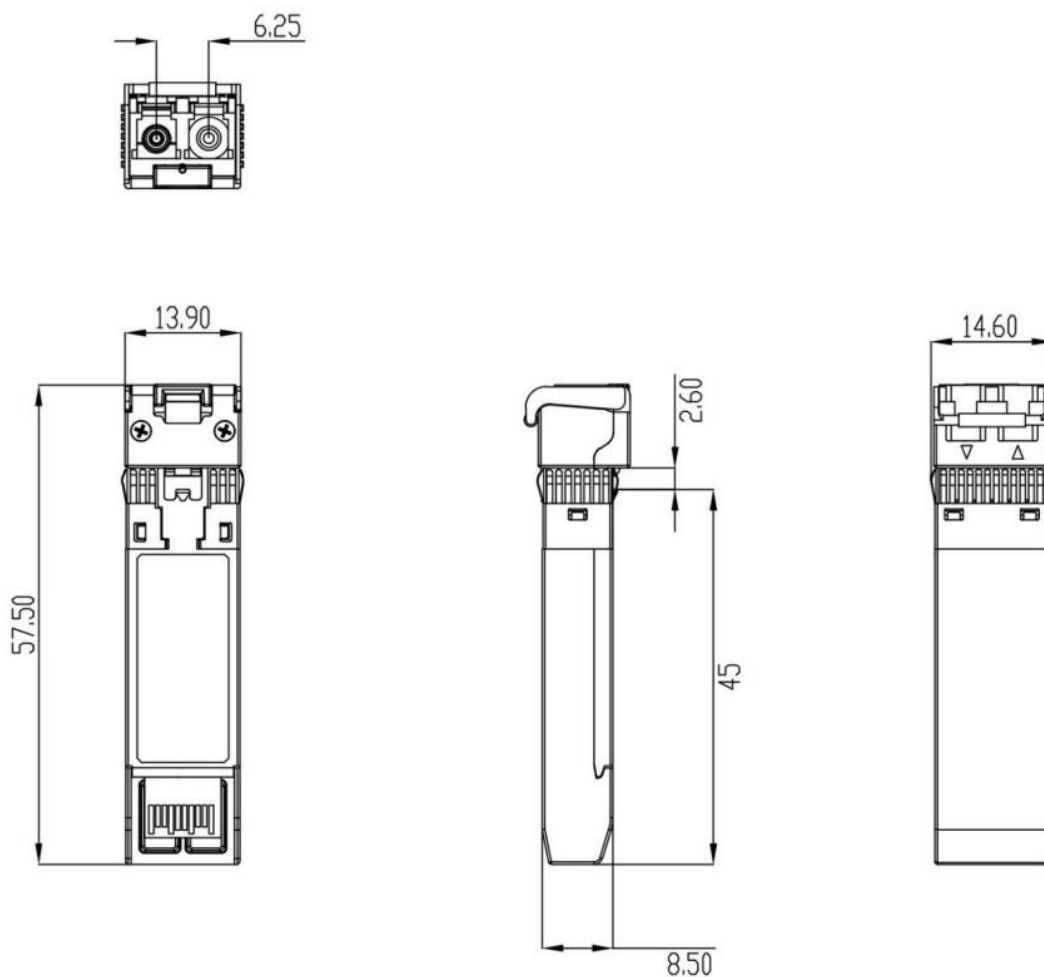


Datasheet version 1.21

**Digital Diagnostic Monitoring Characteristics**

Parameter	Accuracy	Unit	Note
Temperature	±3	°C	Internal Calibration
Supply Voltage	±0.1	V	Internal Calibration
TX Bias Current	±5	mA	Internal Calibration
TX Output Power	±3	dB	Internal Calibration
RX Received Optical Power	±3	dB	Internal Calibration

**Mechanical Dimensions**



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

Part Number	TX	RX	Link	DDM	Mode	Temp.
8330-225D-V1	1310nm	1260nm~1620nm	40km	Yes	Single-mode	0~70°C
8330-225DE-V1	1310nm	1260nm~1620nm	40km	Yes	Single-mode	-40~85°C
8330-205D-V1	1550nm	1260nm~1620nm	40km	Yes	Single-mode	0~70°C
8330-205DE-V1	1550nm	1260nm~1620nm	40km	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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