

## Features

- Supports rate from 1.25 Gb/ to 10.3 Gb/s bit rates
- Optical interface compliant to IEEE 802.3ae
- Electrical interface compliant to SFF-8431
- Hot Pluggable
- 1310nm DFB transmitter, PIN photo-detector
- Operating case temperature: 0 to 70 °C
- Low power consumption
- Applicable for 10km SMF connection
- All-metal housing for superior EMI performance
- Advanced firmware allow customer system encryption information to be stored in transceiver
- Cost effective SFP+ solution, enables higher port densities and greater bandwidth
- RoHS6 compliant (lead free)



## Applications

- 10GBASE-LR at 10.3125Gbps
- Other optical links

## Description

This SFP-LX / SFP+ LR dual rate SFP+ optical transceivers are based on 1G and 10G Ethernet standard, which are compliant with SFF-8431, IEEE 802.3-2012 10GBASE-LR/LW and 1000BASE-LX and provide a quick and reliable interface for the 1G and 10G Ethernet application. The digital diagnostics functions are available via the 2-wire serial bus, as specified in SFF-8472.

### Absolute Maximum Ratings

Parameter	Symbol	Min.	Max.	Units	Note
Storage Temperature	$T_c$	-40	85	°C	
Operating Case Temperature	$T_c$	0	70	°C	
Supply Voltage	$V_{cc}$	0	3.6	V	
Relative Humidity	$RH$	5	95	%	
RX Input Average Power	$P_{max}$	---	1.5	dBm	

### Recommended Operating Conditions

Parameter	Symbol	Min.	Max.	Units	Note
Supply Voltage	$V_{cc}$	3.135	3.465	V	
Operating Case Temperature	$T_c$	0	70	°C	

### Low Speed Characteristics

Parameter	Symbol	Min.	Max.	Units	Note
Power Consumption			1	W	
TX_Fault,RX_LOS	$V_{OL}$	0	0.4	V	
	$V_{OH}$	Host_Vcc-0.5	Host_Vcc+0.3	V	
TX_DIS	$V_{IL}$	-0.3	0.8	V	
	$V_{IH}$	2.0	VCCT+0.3	V	
RS0,RS1	$V_{IL}$	-0.3	0.8	V	
	$V_{IH}$	2.0	VCCT+0.3	V	

**Transmitter Electro-optical Characteristics**

**V<sub>CC</sub> = 3.135 V to 3.465 V, T<sub>C</sub> = 0 °C to 70 °C**

<i>Parameter</i>	<i>Symbol</i>	<i>Min.</i>	<i>Typ.</i>	<i>Max.</i>	<i>Units</i>	<i>Note</i>
Data Rate		1.250	10.3125	---	Gbps	
Power Consumption				1000	mW	
Single Ended Output Voltage Tolerance		-0.3	-	4.0	V	
C common mode voltage tolerance		15	-	-	mV	
Tx Input Diff Voltage	<i>V<sub>I</sub></i>	400		1600	mV	
Tx Fault	<i>V<sub>oL</sub></i>	-0.3		0.4	V	At 0.7mA
Data Dependent Input Jitter	<i>DDJ</i>			0.10	UI	
Data Input Total Jitter	<i>TJ</i>			0.28	UI	
Center wavelength (range)	<i>λ<sub>c</sub></i>	1260		1355	nm	
Side Mode Suppression Ratio	<i>SMSR</i>	30			dB	
Launched power	<i>P<sub>out</sub></i>	-7.2	---	0.5	dBm	1
Launched power OMA	<i>dBm</i>		-5.2			
Launched power OMA -TDP	<i>dBm</i>	-6.2				
Transmitter Dispersion Penalty	<i>TDP</i>		0		dB	2
Average launch power of OFF transmitter (max)				-30	dBm	
Extinction Ratio (min)	<i>ER</i>	3.5			dB	3
RIN12 OMA (max)				-128	dB/Hz	
Optical Return Loss Tolerance		12			dB	

Note 1: The optical power is launched into SMF

Note 2: In G.652 and G.655 (NDSF)

Note 3: Measured with a PRBS 2<sup>31</sup>-1 test pattern@10.3125Gbps

**Receiver Electro-optical Characteristics**

**V<sub>CC</sub> = 3.135 V to 3.465 V, T<sub>C</sub> = 0 °C to 70 °C**

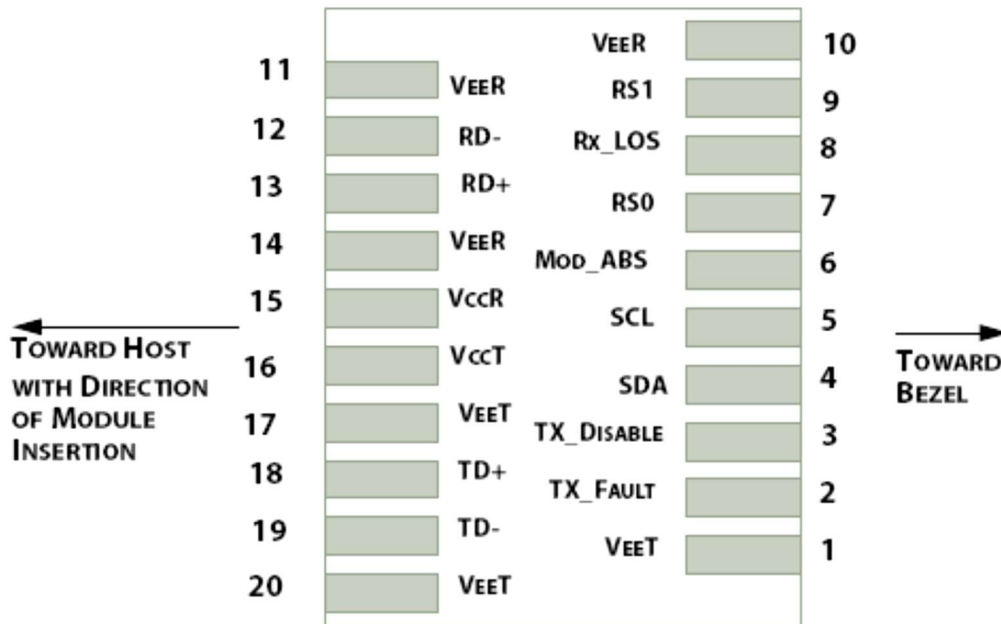
<i>Parameter</i>	<i>Symbol</i>	<i>Min.</i>	<i>Typ.</i>	<i>Max.</i>	<i>Units</i>	<i>Note</i>
Single Ended Output Voltage Tolerance		-0.3	-	4.0	V	
Rx Output Diff Voltage	<i>V<sub>o</sub></i>	300		850	mV	
Rx Output Rise and Fall Time	<i>T<sub>r</sub>/T<sub>f</sub></i>	30			ps	20% to 80%
Total Jitter	<i>T<sub>J</sub></i>			0.70	UI	
Deterministic Jitter	<i>DJ</i>			0.42	UI	
Center wavelength (range)	<i>λ<sub>C</sub></i>	1260		1355	<i>nm</i>	
Receive overload (max) in average power	<i>P<sub>IN</sub></i>			0.5	dBm	1
Receiver Sensitivity (min)in average power	<i>P<sub>sens</sub></i>	-14.4			dBm	1.3
Receiver Sensitivity (max)in OMA	<i>P<sub>sens</sub></i>			-12.6	dBm	2.3
Receiver Reflectance (max)				-12	dB	
Stressed Receiver Sensitivity(max)in OMA				-10.3	dBm	2
Vertical eye closure penalty(min)		2.2			dB	3
Stressed eye Jitter(min)		0.7			Ulp-p	2
Receive electrical 3dB upper cutoff frequency (max)				12.3	GHz	
Receiver power damage(max)				1.5	dBm	

Note 1: The optical power is launched into SMF

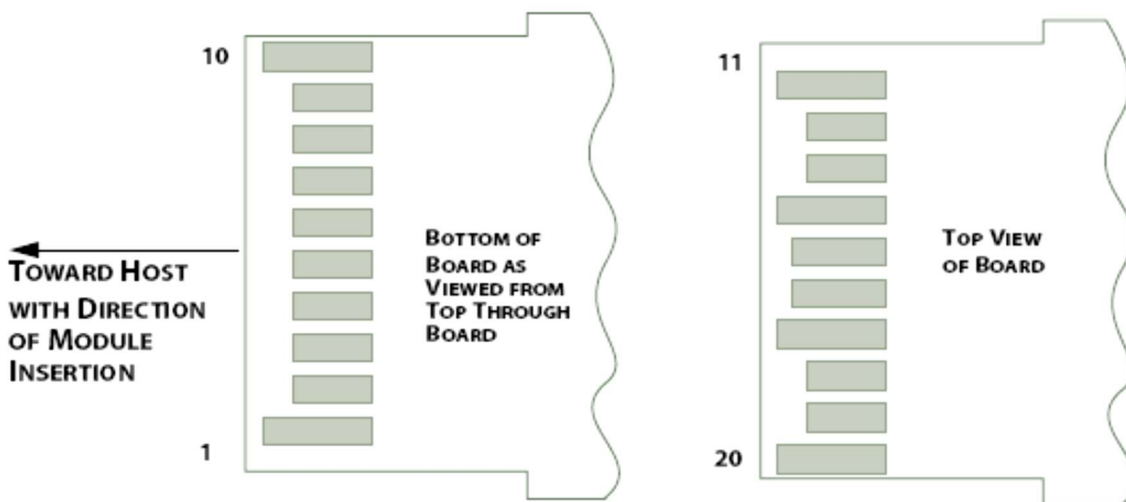
Note 2: Measured with a PRBS 2<sup>31</sup>-1 test pattern@10.3125Gbps

Note 3: Measured with a PRBS 2<sup>31</sup>-1 test pattern@10.3125Gbps BER≤10<sup>-12</sup>

**Pin Assignment**



**Module Interface to Host**



**Module Contact Assignment**

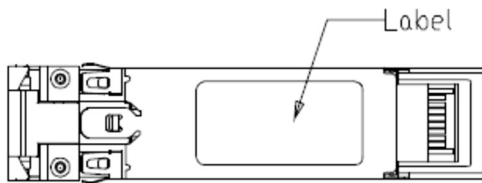
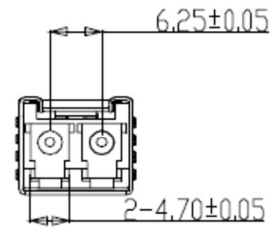
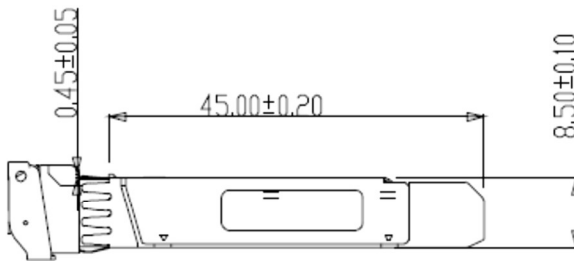
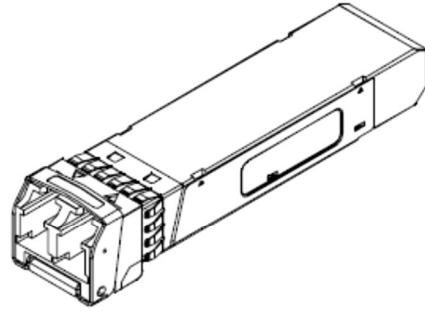
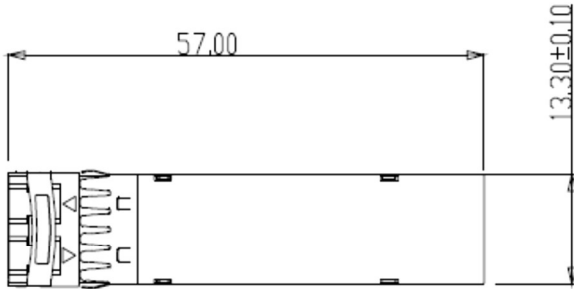
## Pin Descriptions

<i>PIN</i>	<i>Logic</i>	<i>Symbol</i>	<i>Name / Description</i>	<i>Note</i>
1		VeeT	Module Transmitter Ground	1
2	LVTTL-O	TX_Fault	Module Transmitter Fault	
3	LVTTL-I	TX_Dis	Transmitter Disable; Turns off transmitter laser output	
4	LVTTL-I/O	SDA	2-Wire Serial Interface Data Line	2
5	LVTTL-I	SCL	2-Wire Serial Interface Clock	2
6		MOD_DEF0	Module Definition, Grounded in the module	
7	LVTTL-I	RS0	Not used	
8	LVTTL-O	RX_LOS	Receiver Loss of Signal Indication Active High	
9	LVTTL-I	RS1	Not used	
10		VeeR	Module Receiver Ground	1
11		VeeR	Module Receiver Ground	1
12	CML-O	RD-	Receiver Inverted Data Output	
13	CML-O	RD+	Receiver Data Output	
14		VeeR	Module Receiver Ground	1
15		VccR	Module Receiver 3.3 V Supply	
16		VccT	Module Receiver 3.3 V Supply	
17		VeeT	Module Transmitter Ground	1
18	CML-I	TD+	Transmitter Non-Inverted Data Input	
19	CML-I	TD-	Transmitter Inverted Data Input	
20		VeeT	Module Transmitter Ground	1

Note:

1. Module ground pins GND are isolated from the module case.
2. Shall be pulled up with 4.7K-10Kohms to a voltage between 3.15V and 3.45V on the host board.

**Dimensions**



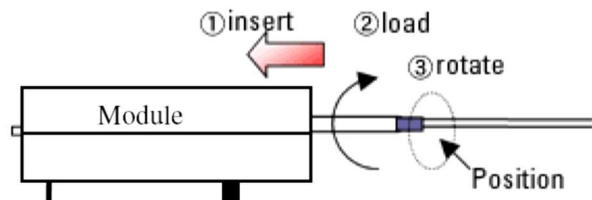
**Optical Receptacle Cleaning Recommendations :**

All fiber stubs inside the receptacle portions were cleaned before shipment. In the event of contamination of the optical ports, the recommended cleaning process is the use of forced nitrogen. If contamination is thought to have remained, the optical ports can be cleaned using a NTT international Cletop® stick type and HFE7100 cleaning fluid. Before the mating of patch-cord, the fiber end should be cleaned up by using Cletop® cleaning cassette.

**Cleaning of patch-cord**



**Cleaning of fiber stub**



1. Insert  
Ensure that stick is held straight when inserting into sleeve.
2. Load  
Apply sufficient pressure (approx 600-700g) to ensure ferrule a little depressed in sleeve.
3. Rotate  
Rotate stick clockwise 4-5 times, while ensuring direct contact with ferrule end-face is maintained.

*Notice: Number of possible wipes:  
Maintenance (repair) ~1 use / piece  
Equipment construction: 4 uses / piece (max.)*

Note: The pictures were extracted from NTT-ME website. And the Cletop® is a trademark registered by NTT-ME



### Ordering Information

<i>Model Number</i>	<i>Part Number</i>	<i>Reach</i>	<i>Voltage</i>	<i>Temperature</i>
SFP-1/10G-LR	OPAT-S10-13-CF	10km	3.3V	0°C to 70 °C

### Modification History

<i>Revision</i>	<i>Date</i>	<i>Description</i>
A1	Aug.2023	Initial Release

**Note: All information contained in this document is subject to change without notice.**