

**SFP-1GB-HD1-31U-20-C**

MSA and TAA 1000Base-CWDM HD1 SFP Transceiver (SMF, 1310nm LTx/HRx, 20km, LC, DOM)

**Features:**

- INF-8074 and SFF-8472 Compliance
- Simplex LC Connector
- Uncooled DFB transmitter and PIN receiver
- Single-mode Fiber
- Commercial Temperature 0 to 70 Celsius
- Hot Pluggable
- Metal with Lower EMI
- Excellent ESD Protection
- RoHS Compliant and Lead Free

**Applications:**

- Gigabit Ethernet over CWDM
- 1x Fibre Channel
- Access, Metro and Enterprise

**Product Description**

This MSA compliant SFP transceiver provides 1000Base-CWDM HD1 throughput up to 20km over single-mode fiber (SMF) at a bidirectional wavelength of 1310nm LTx/HRx via an LC connector. It can operate at temperatures between 0 and 70C. The listed reach has been determined using a link budget calculation and tested in a standard environment. Actual link distances achieved will be dependent upon the deployed environment. All of our transceivers are built to comply with Multi-Source Agreement (MSA) standards and are uniquely serialized and tested for data-traffic and application to ensure seamless network integration. Additional product features include Digital Optical Monitoring (DOM) support which allows access to real-time operating parameters. This transceiver is Trade Agreements Act (TAA) compliant. We stand behind the quality of our products and proudly offer a limited lifetime warranty.

ProLabs' transceivers are RoHS compliant and lead-free.

TAA refers to the Trade Agreements Act (19 U.S.C. & 2501-2581), which is intended to foster fair and open international trade. TAA requires that the U.S. Government may acquire only "U.S.-made or designated country end products.")



### CWDM Available Wavelengths

Wavelength	Min.	Typ.	Max.
27	1264.5	1271	1277.5
29	1284.5	1291	1297.5
31	1304.5	1311	1317.5
33	1324.5	1331	1337.5
35	1344.5	1351	1357.5
37	1364.5	1371	1377.5
39	1384.5	1391	1397.5
41	1404.5	1411	1417.5
43	1424.5	1431	1437.5
45	1444.5	1451	1457.5
47	1464.5	1471	1477.5
49	1484.5	1491	1497.5
51	1504.5	1511	1517.5
53	1524.5	1531	1537.5
55	1544.5	1551	1557.5
57	1564.5	1571	1577.5
59	1584.5	1591	1597.5
61	1604.5	1611	1617.5

### Absolute Maximum Ratings

Parameter	Symbol	Min.	Typ.	Max.	Unit	Notes
Power Supply Voltage	Vcc	+3.135	+3.30	+3.465	V	
Power Supply Current	Icc			500	mA	1
Power Supply Noise Rejection	PSNR			100	mVp-p	2
Operating Temperature	Tc	-40		+85	°C	3
Storage Temperature	Tstg	-40		+85	°C	4
Power Supply Storage	Vcc		< +4.0		V	
Ambient Humidity	AH	5		95	%	5

#### Notes:

1. Cooled type.
2. From 100Hz to 1MHz.
3. Case with airflow.
4. Ambient.

5. Without dew.

### Electrical Characteristics

Parameter	Symbol	Min.	Typ.	Max.	Unit	Notes
<b>Transmitter</b>						
<b>Data Rate</b>	DRT	1.0625		1.25	Gbps	
<b>Differential Input Voltage</b>	VIN,pp	150		1000	mV	
<b>Differential Input Impedance</b>	ZIN	90	100	110	$\Omega$	
<b>Tx_Disable</b>	<b>Input_Low</b>	VIL	0	0.8	V	1
	<b>Input_High</b>	VIH	2.0	3.465	V	
	<b>Assert Time</b>	tOFF		10	us	2
	<b>Negate Time</b>	tON		1	ms	3
<b>Tx_Disable to Reset</b>	treset	10			us	4
<b>Time to Initialize_Cooled (Including Reset of Tx_Fault)</b>	tInit_cooled			10	sec	5
<b>Tx_Fault</b>	<b>Output_Low</b>	VFOL	0	0.8	V	6
	<b>Output_High</b>	VFOH	2.0	Vcc+0.3	V	
<b>Receiver</b>						
<b>Data Rate</b>	DR	1.0625		1.25	Gbps	
<b>Differential Output Voltage</b>	VOUT	300		850	mV	-
<b>Differential Output Impedance</b>	ZOUT	90	100	110	$\Omega$	-
<b>Rx_LOS (Loss of Signal)</b>	<b>Output_Low</b>	VLOSL	0	0.8	V	6
	<b>Output_High</b>	VLOSH	2	Vcc+0.3	V	
	<b>Assert Time</b>	tLOS-ON		100	us	7
	<b>De-Assert Time</b>	tLOS-OFF		100	us	8

### Notes:

1. LVTTL, normal at low, high is shutdown (Poff).
2. Assert time tOFF: high.
3. Negate time tON: low.
4. Tx\_Disable to reset treset: high.
5. Cooled version, for wavelength stabilization at worst-case (low & high temperatures).
6. LVTTL, low is normal.
7. Assert time tLOS-ON: low → high.
8. De-assert time tLOS-OFF: high → low.

## Optical Characteristics

Parameter	Symbol	Min.	Typ.	Max.	Unit	Notes
<b>Transmitter</b>						
<b>Optical Transmit Power</b>	Pf	-2.5		2.0	dBm	
<b>Transmitter Disable (Off) Power</b>	Poff			-35	dBm	2
<b>Peak Wavelength</b>	$\lambda_P$	$\lambda_C-6.5 \sim \lambda_C-1.5$			nm	1
<b>Spectral Width</b>	$\Delta\lambda$			1.0	nm	3
<b>Side-Mode Suppression Ratio</b>	SMSR	30			dB	
<b>RIN<sub>12</sub>OMA</b>	RIN			-117	dB/Hz	
<b>Dispersion Penalty</b>	DP			1.5	dB	
<b>Extinction Ratio</b>	ER	8.2			dB	4
<b>Eye Pattern Mask</b>	IEEE802.3/2008 Section 3 Figure 38-2					
<b>Receiver</b>						
<b>Optical Sensitivity</b>	S			-26.5	dBm	5
<b>Optical Overload</b>	OL	2.0			dBm	5
<b>Operating Wavelength</b>	$\lambda_O$	$\lambda_C+2.0 \sim \lambda_C+6.5$			nm	1
<b>Rx_LOS (Loss of Signal)</b>	<b>Assert</b>	PA	-38.0			dBm
	<b>De-Assert</b>	PD			-26.5	dBm
	<b>Hysteresis</b>	PA-PD	0.5	2.0	5.0	dB
<b>Receiver Reflectance</b>				-27	dB	7
<b>RSSI Calibration</b>	RCAL	Internally Calibrated				

### Notes:

1. CWDM, DFB-LD,  $\lambda_C = 1271, 1291, 1311, 1331, 1351, 1371, 1391, 1411, 1431, 1451, 1471, 1491, 1511, 1531, 1551, 1571, 1591$ , and 1611nm.
2. At Tx\_Disable = high.
3. At -20dB.
4. At 1.25Gbps, PRBS 2<sup>7</sup>-1, Figure 1.
5. PRBS2<sup>7</sup>-1, BER $1 \times 10^{-12}$ , and ER=8.2dB.
6. Squelch function enabled.
7. At  $\lambda_O$ .

## Pin Descriptions

Pin	Symbol	Name/Description	Plug Sequence	Notes
1	VeeT	Module Ground.	1	
2	Tx_Fault	Status Out.	3	
3	Tx_Disable	Control In.	3	
4	MOD_DEF(2)	Input/Output (SDA, I <sup>2</sup> C Data).	3	
5	MOD_DEF(1)	Input/Output (SCL, I <sup>2</sup> C Clock).	3	
6	MOD_DEF(0)	Indicates that the module is present. Grounded internally.	3	
7	Rate Select	Rate Select In. Not Used.	3	1
8	Rx_LOS	Status Out.	3	
9	VeeR	Module Ground.	3	
10	VeeR	Module Ground.	1	
11	VeeR	Module Ground.	1	
12	Rx_Data-	Data Out Negative.	3	
13	Rx_Data+	Data Out Positive.	3	
14	VeeR	Module Ground.	1	
15	Rx_Vcc	Power.	2	
16	Tx_Vcc	Power.	2	
17	VeeT	Module Ground.	1	
18	Tx_Data+	Data In Positive.	3	
19	Tx_Data-	Data In Negative.	3	
20	VeeT	Module Ground.	1	

### Notes:

1. Internally pulled down with >51kΩ resistor.

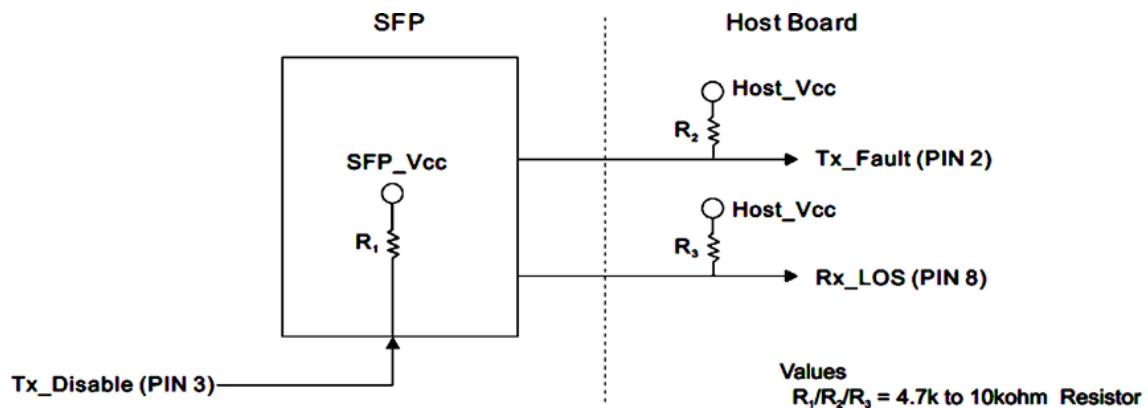
### Recommended Circuit Schematic

Tx\_Disable: Transmitter Disable, logic high, 4.7k to 10kΩ pull-up to the Vcc on the SFP.

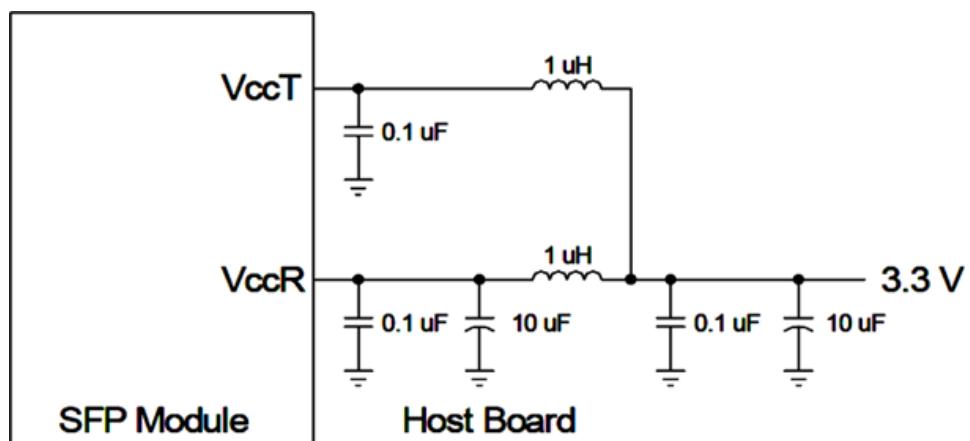
Tx\_Fault: Transmitter Fault, logic high, 4.7k to 10kΩ pull-up to the Vcc on the host.

Rx\_LOS: Receiver Loss of Signal, logic high, 4.7k to 10kΩ pull-up to the Vcc on the host.

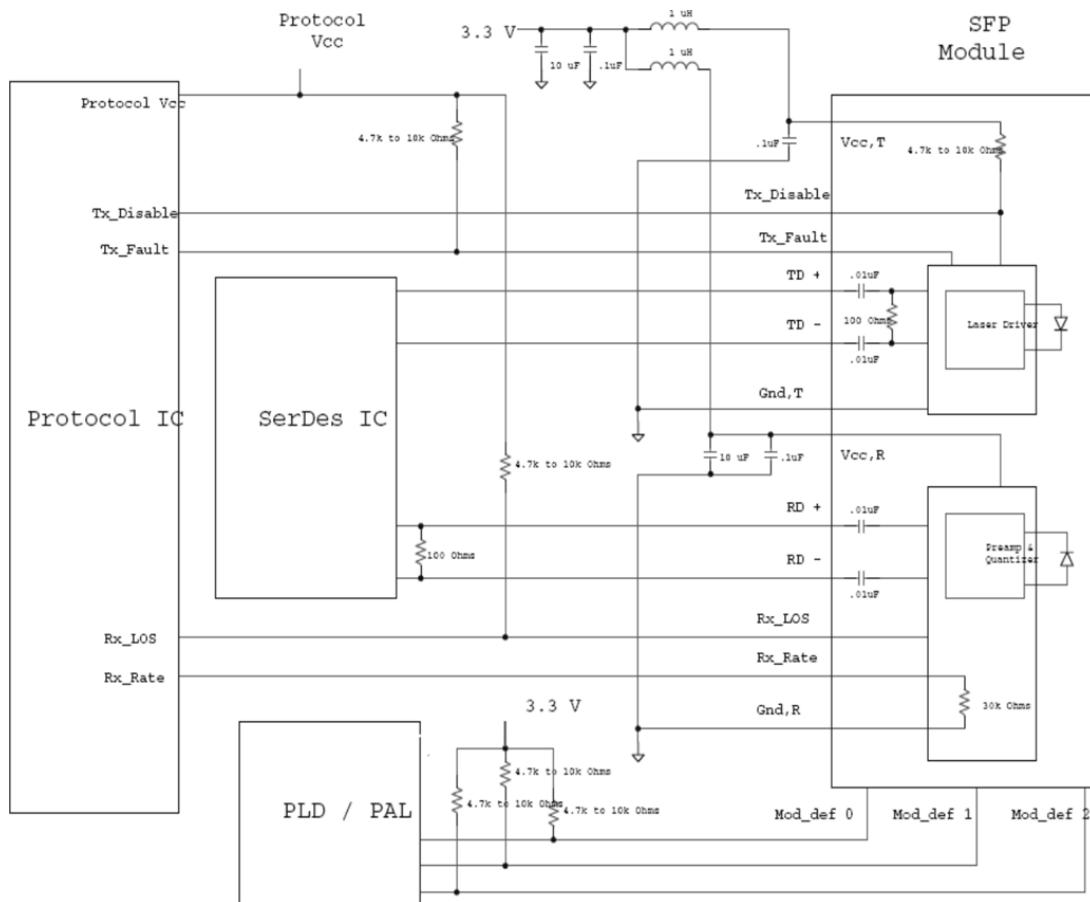
### Signal Definitions



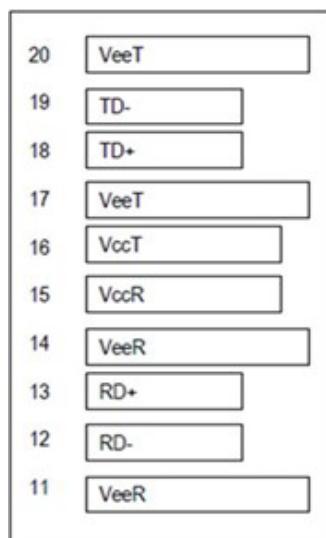
### Power Coupling



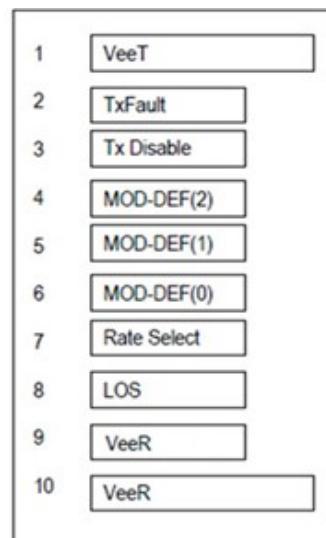
## SFP Host Board Schematic



## 20-Pin Connector

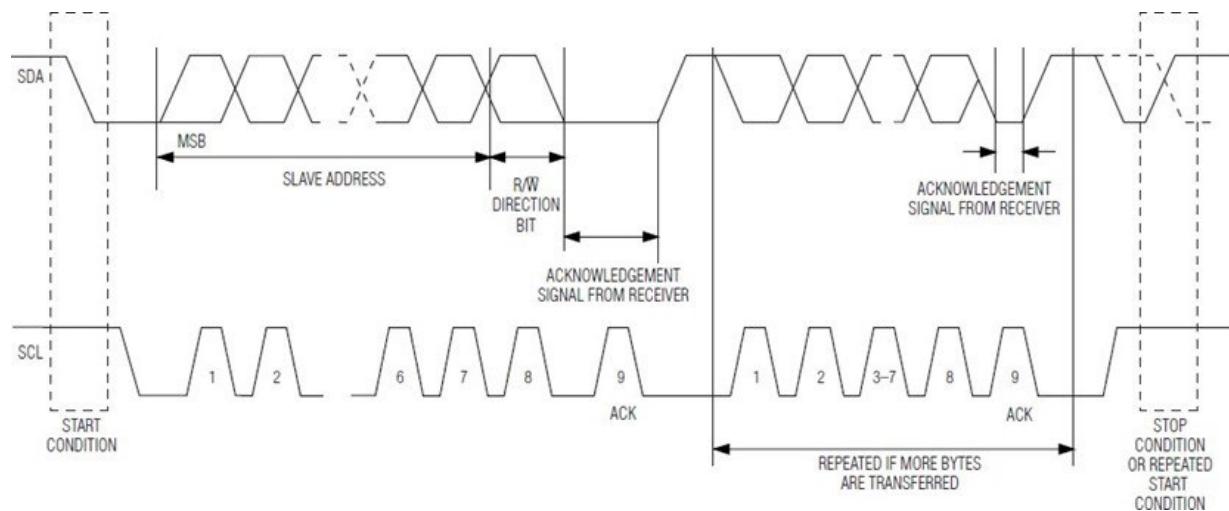


Top of Board

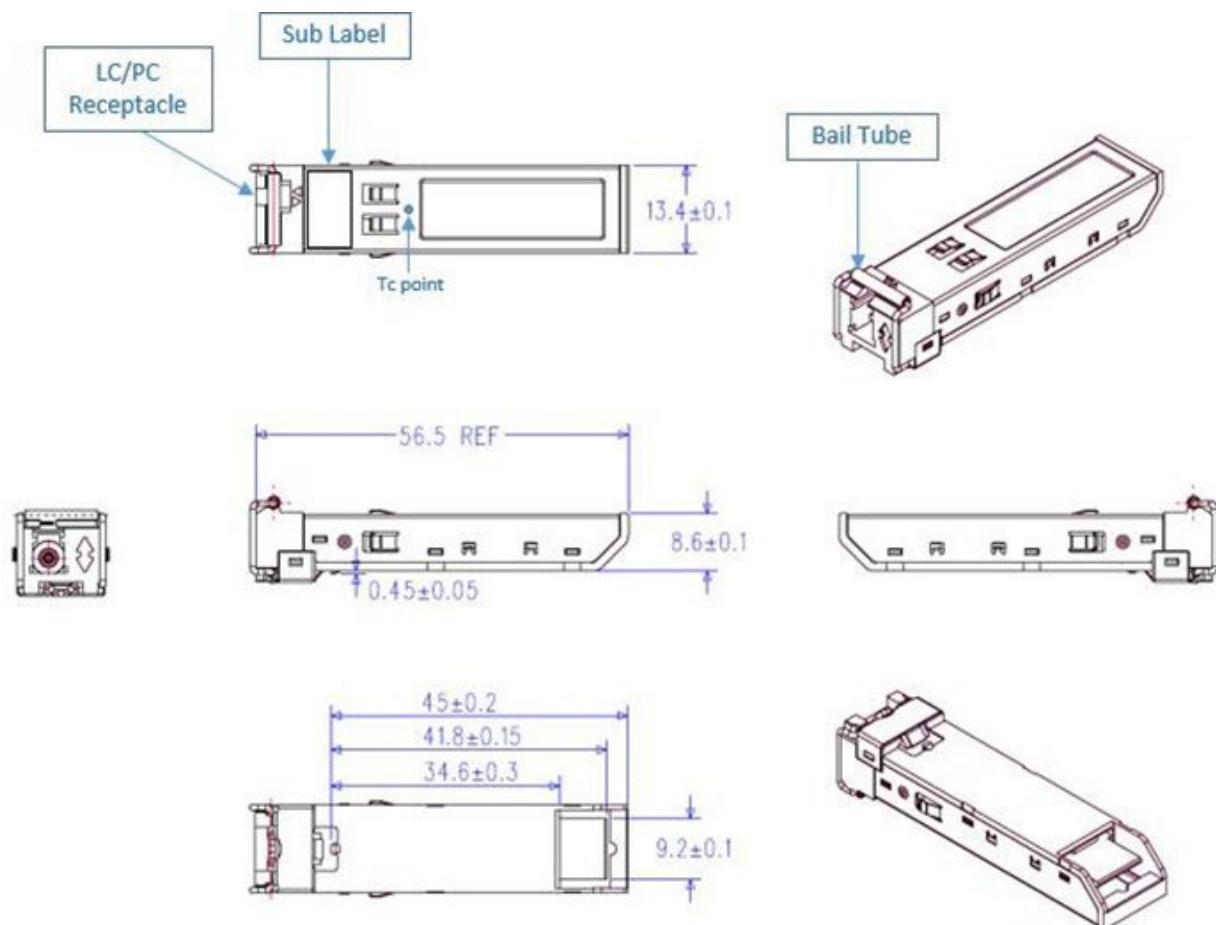


Bottom of Board (as viewed thru top of board)

## 2-Wire Data Transfer Protocol



## Mechanical Specifications



## About ProLabs

Our experience comes as standard; for over 15 years ProLabs has delivered optical connectivity solutions that give our customers freedom and choice through our ability to provide seamless interoperability. At the heart of our company is the ability to provide state-of-the-art optical transport and connectivity solutions that are compatible with over 90 optical switching and transport platforms.

## Complete Portfolio of Network Solutions

ProLabs is focused on innovations in optical transport and connectivity. The combination of our knowledge of optics and networking equipment enables ProLabs to be your single source for optical transport and connectivity solutions from 100Mb to 400G while providing innovative solutions that increase network efficiency. We provide the optical connectivity expertise that is compatible with and enhances your switching and transport equipment.

## Trusted Partner

Customer service is our number one value. ProLabs has invested in people, labs and manufacturing capacity to ensure that you get immediate answers to your questions and compatible product when needed. With Engineering and Manufacturing offices in the U.K. and U.S. augmented by field offices throughout the U.S., U.K. and Asia, ProLabs is able to be our customers best advocate 24 hours a day.



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