

### **SFP-10GBASE-LR-20-I-C**

MSA and TAA Compliant 10GBase-LR SFP+ Transceiver (SMF, 1310nm, 20km, LC, DOM, -40 to 85C)

#### **Features:**

- Compliant with IEEE802.3ae 10GBASE-LR/LW
- Compliant with MSA SFP+ Specification SFF-8431
- 1310nm DFB-LD Transmitter
- Distance up to 20km
- Single 3.3V Power Supply and TTL Logic Interface
- Duplex LC Connector
- Industrial Temperature -40 to 85 Celsius
- Hot-Pluggable
- Metal with Lower EMI
- Excellent ESD Protection
- RoHS compliant and Lead Free



#### **Applications:**

- 10GBase-LR Ethernet
- 8x/10x Fibre Channel
- Access, Datacenter and Enterprise
- Mobile Fronthaul CPRI/OBSAI

#### **Product Description**

This MSA Compliant SFP+ transceiver provides 10GBase-LR throughput up to 20km over single-mode fiber (SMF) using a wavelength of 1310nm via an LC connector. It is built to MSA standards and is uniquely serialized and data-traffic and application tested to ensure that they will integrate into your network seamlessly. Digital optical monitoring (DOM) support is also present to allow 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."



## Absolute Maximum Ratings

Parameter	Symbol	Min.	Typ.	Max.	Unit	Notes
Maximum Supply Voltage	V <sub>CC</sub>	-0.5		4	V	1
Storage Temperature	T <sub>stg</sub>	-40		85	°C	
Operating Case Temperature	T <sub>c</sub>	-40		85	°C	
Relative Humidity	RH	0		85	%	
Data Rate	DR	9.83	10.3125	11.3	Gb/s	2
Bit Error Rate	BER			10 <sup>-12</sup>		

## Notes:

1. For electrical interface
2. IEEE 802.3ae

## Electrical Characteristics

Parameter	Symbol	Min.	Typ.	Max.	Unit	Notes
Module Supply Voltage	V <sub>CC</sub>	3.14	3.3	3.46	V	
Module Supply Current	I <sub>CC</sub>		200	350	mA	
Power Dissipation	PD		0.65	1.2	W	
Transmitter						
Input Differential Impedance	R <sub>IN</sub>		100		Ω	
Differential Data Input Swing	V <sub>IN</sub> PP	180		700	mV	
Transmit Disable Voltage	V <sub>D</sub>	2		V <sub>CC</sub>	V	
Transmit Enable Voltage	V <sub>EN</sub>	V <sub>EE</sub>		V <sub>EE</sub> +0.8	V	
Receiver						
Differential Data Output Swing	V <sub>OUT</sub> PP	300		850	mV	
Data Output Rise/Fall Time (20%-80%)	t <sub>r</sub> /t <sub>f</sub>	28			ps	
LOS Assert	V <sub>LOS</sub> A	2		V <sub>CC</sub> HOST	V	
LOS De-Assert	V <sub>LOS</sub> D	V <sub>EE</sub>		V <sub>EE</sub> +0.5	V	

## Optical Characteristics

Parameter	Symbol	Min.	Typ.	Max.	Unit	Notes
Transmitter						
Output Optical Power	P <sub>TX</sub>	-8.2		0.5	dBm	1
Optical Center Wavelength	$\lambda_c$	1260		1355	nm	
Optical Modulation Amplitude	OMA	-5.2			dBm	2
Extinction Ratio	ER	3.5	5.5		dB	
Spectral Width(-20dB)	$\Delta\lambda$			1	nm	
Side Mode Suppression Ratio	SMSR	30			dB	
Relative Intensity Noise	RIN			-128	dB/Hz	
Transmitter Dispersion Penalty	TDP			3.2	dB	
Launch Power of OFF Transmitter	P <sub>OUT_OFF</sub>			-30	dBm	1
Transmitter Jitter						2
Receiver						
Optical Center Wavelength	$\lambda_c$	1260		1600	nm	
Average Receive Power	P <sub>RX</sub>	-14.4		0.5	dBm	
Receiver Sensitivity @10.3Gb/s	R <sub>X_SEN</sub>			-14.4	dBm	3
Receiver Reflectance	TR <sub>RX</sub>			-12	dB	
LOS Assert	LOS <sub>A</sub>	-30			dBm	
LOS De-Assert	LOS <sub>D</sub>			-17	dBm	
LOS Hysteresis	LOS <sub>H</sub>	0.5			dB	

### Notes:

1. Average
2. According to IEEE 802.3ae requirement.
3. Test the resulting value using the minimum ER value within the defined range; BER<10<sup>-12</sup>; 2<sup>31</sup>-1 PRBS.

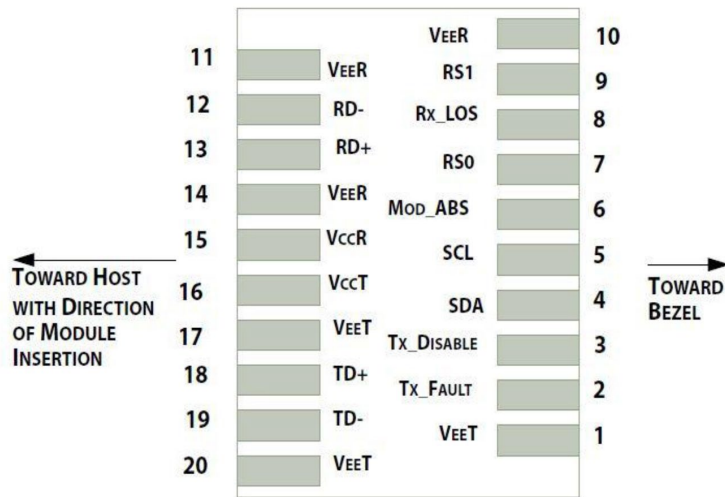
## Pin Descriptions

Pin	Symbol	Name/Descriptions	Ref.
1	VeeT	Transmitter Ground.	1
2	Tx_Fault	Transmitter Fault. LVTTTL-O. "High" indicates a fault condition.	2
3	Tx_Disable	Transmitter Disable. LVTTTL-I. "High" or "open" disables the transmitter.	3
4	SDA	2-Wire Serial Interface Data. LVCMOS-I/O. MOD-DEF2.	4
5	SCL	2-Wire Serial Interface Clock. LVCMOS-I/O. MOD-DEF1.	4
6	MOD_ABS	Module Absent (Output). Connected to VeeT or VeeR in the module.	5
7	RS0	N/A.	6
8	Rx_LOS	Receiver Loss of Signal. LVTTTL-O.	2
9	RS1	N/A.	6
10	VeeR	Receiver Ground.	1
11	VeeR	Receiver Ground.	1
12	RD-	Inverse Received Data Out. CML-O.	
13	RD+	Received Data Out. CML-O.	
14	VeeR	Receiver Ground.	
15	VccR	+3.3V Receiver Power.	
16	VccT	+3.3V Transmitter Power.	
17	VeeT	Transmitter Ground.	1
18	TD+	Transmitter Data In. CML-I.	
19	TD-	Inverse Transmitter Data In. CML-I.	
20	VeeT	Transmitter Ground.	1

## Notes:

1. The module signal grounds are isolated from the module case.
2. This is an open collector/drain output that on the host board requires a 4.7K $\Omega$  to 10K $\Omega$  pull-up resistor to Host\_Vcc.
3. This input is internally biased high with a 4.7K $\Omega$  to 10K $\Omega$  pull-up resistor to VccT.
4. 2-Wire Serial Interface Clock and Data lines require an external pull-up resistor dependent on the capacitance load.
5. This is a ground return that, on the host board, requires a 4.7K $\Omega$  to 10K $\Omega$  pull-up resistor to the Host\_Vcc.
6. Rate select can also be set through the 2-wire bus in accordance with SFF-8472 v. 12.1. Rx Rate Select is set at Bit 3, Byte 110, and Address A2h, and Tx Rate Select is set at Bit 3, Byte 118, and Address A2h.  
**Note:** Writing a "1" selects maximum bandwidth operation. Rate select is the logic OR of the input state of Rate Select Pin and 2-wire bus.

Electrical Pin-out Details



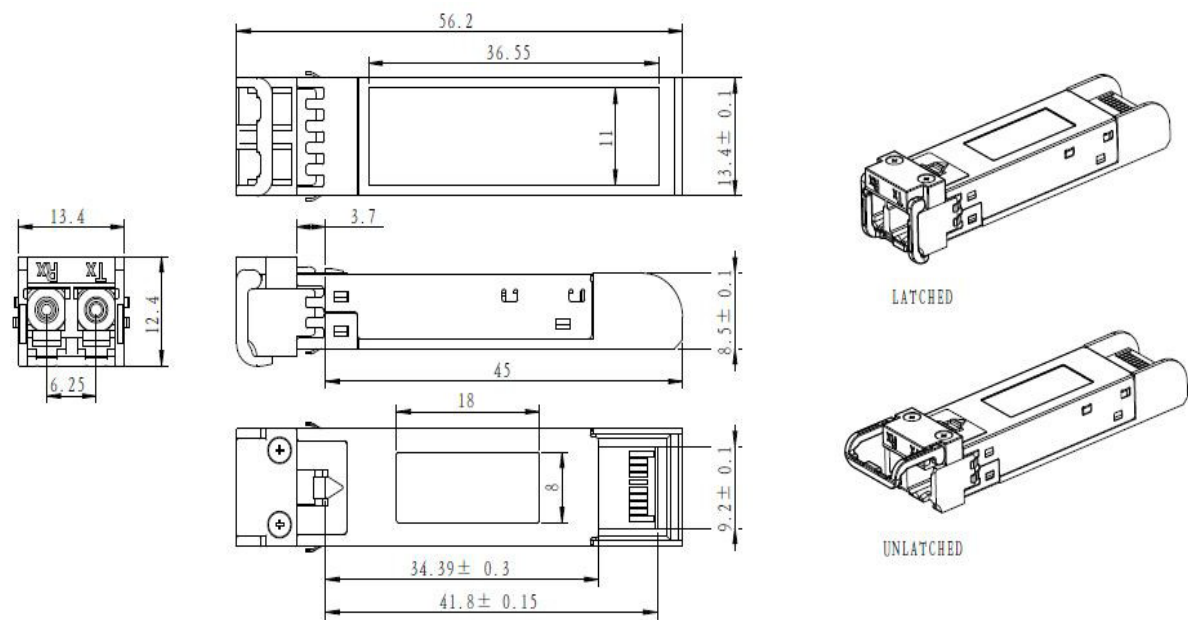
Block Diagram



Mechanical Specifications

ALL DIMENSIONS ARE ±0.2mm UNLESS OTHERWISE SPECIFIED

UNIT: mm



EEPROM Information

EEPROM memory map-specific data field description is as below:

2 wire address 1010000X (A0h)	2 wire address 1010001X (A2h)
0	0
Serial ID Defined by SFP MSA (96 bytes)	Alarm and Warning Thresholds (56 bytes)
95	55
Vendor Specific (32 bytes)	Cal Constants (40 bytes)
127	95
Reserved, SFF8079 (128 bytes)	Real Time Diagnostic Interface (24 bytes)
	119
	Vendor Specific (8 bytes)
	127
	User Writable EEPROM (120 bytes)
	247
255	Vendor Specific (8 bytes)
	255

## 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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