

**Features**



- „ Complaint with IEEE 802.3ae 10GBASE-LR
- „ Simplex LC connector
- „ Electrical interface compliant to SFF-8431 specifications for enhanced 8.5 and 10 Gigabit small form factor pluggable module “SFP+”
- „ 1270/1330nm DFB transmitter, PIN photo-detector
- „ Compliant with SFF8472 Digital Diagnostic Standard
- „ 2-wire interface for management specifications compliant with SFF 8472 digital diagnostic
- „ ROHS compliant

**Applications**

- „ Data Center Interconnect
- „ CPRI/OBASI Wireless Backhaul  
LTE eNode B Interconnect

**Ordering Information**

<i>Model Number</i>	<i>Reach</i>	<i>Input/Output</i>	<i>TX/RX</i>	<i>Signal Detect</i>	<i>Voltage</i>	<i>Temperature</i>
10G-ESSFP+BIDI-20-33	20 km	AC/AC	1330/1270	TTL	3.3V	0°C to 70 °C
10G-ESSFP+BIDI-20-33-I	20 km	AC/AC	1330/1270	TTL	3.3V	-40°C to 85 °C

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

**Diagnostics Monitoring**

<i>Parameter</i>	<i>Accuracy</i>	<i>Unit</i>	<i>Calibration</i>
Temperature	± 3	°C	External
Voltage	± 0.08	V	
Bias Current	± 10%	mA	
TX Power	± 3 dB	dBm	
RX Power	± 3 dB	dBm	

**Absolute Maximum Ratings**

<i>Parameter</i>	<i>Symbol</i>	<i>Min.</i>	<i>Max.</i>	<i>Units</i>	<i>Note</i>
Storage Temperature	$T_s$	-40	85	°C	
Supply Voltage	$V_{cc}$	0	3.6	V	
Relative Humidity	$RH$	5	95	%	
RX Input Average Power	$P_{max}$	---	0	dBm	

**Recommended Operating Conditions**

<i>Parameter</i>	<i>Symbol</i>	<i>Min.</i>	<i>Max.</i>	<i>Units</i>	<i>Note</i>
Case Operating Temperature	$T_c$	0	70	°C	
Supply Voltage	$V_{cc}$	3.135	3.465	V	
Supply Current	$I_{cc}$	---	300	mA	

**Transmitter Electro-optical Characteristics**
**V<sub>cc</sub> = 3.1 V to 3.5 V, T<sub>c</sub> = 0 °C to 70 °C (-40 °C to 85 °C)**

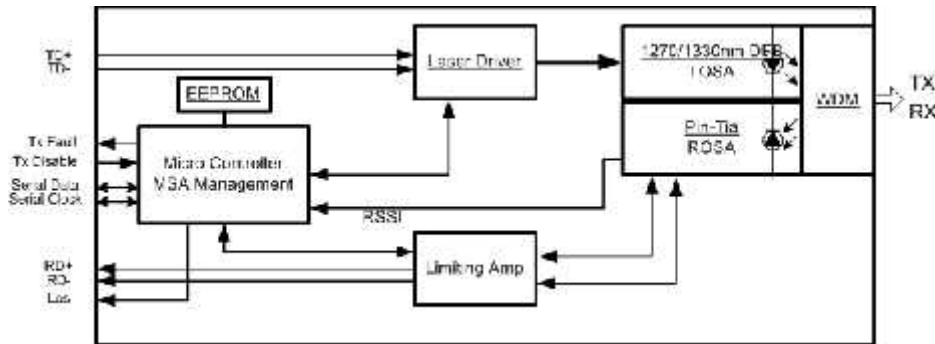
<i>Parameter</i>	<i>Symbol</i>	<i>Min.</i>	<i>Typ.</i>	<i>Max.</i>	<i>Units</i>	<i>Note</i>
Data Rate		---	10.3125	---	Gbps	
Output Optical Power	<i>P<sub>out</sub></i>	-5.2	---	0.5	dBm	Average
Center Wavelength	<i>c</i>	1325	---	1335	nm	
Side mode Suppression Ratio	<i>SSR<sub>min</sub></i>	30			dB	
Relative Intensity Noise	<i>RIN</i>	---	---	-128	dB/Hz	12dB reflection
Max. P <sub>out</sub> TX-DISABLE Asserted	<i>P<sub>OFF</sub></i>	---	---	-30	dBm	
Extinction Ratio	<i>ER</i>	3.5	---	---	dB	
Transmitter Dispersion Penalty	<i>TDP</i>	---	---	3.2	dB	
Optical Return Loss Tolerance		---	---	12	dB	
Power consumption		---	800	1000	mW	
Single Ended Output Voltage Tolerance		-0.3	---	4	V	
Differential Input Voltage	<i>VI</i>	180	---	700	mV	
Commonmode voltage tolerance		15	---	---	mV	
TX Fault	<i>VoL</i>	-0.3		0.4	V	At 0.7mA
Data Dependent Input Jitter	<i>DDJ</i>			0.1	UI	
Data Input Total Jitter	<i>TJ</i>			0.28	UI	

**Receiver Electro-optical Characteristics**
 **$V_{CC} = 3.1 \text{ V to } 3.5 \text{ V}$ ,  $T_C = 0^\circ \text{ C to } 70^\circ \text{ C}$  (-40°C to 85°C)**

Parameter	Symbol	Min.	Typ.	Max.	Units	Note
Receiver Sensitivity(	$P_{IN}$	-12	---	--	dBm	
Operating Center Wavelength	$\lambda_c$	1250	---	1280	nm	
Overload	$P_{IN}$	---	---	0.5	dB	
Receiver Reflectance		---	---	-12		
Vertical eye closure penalty		2.2			dB	Note 1
Loss of Signal-Assert	$P_D$	-30	---	---	dBm	
Loss of Signal-Deasserted	$P_D$	---	---	-12	dBm	
Loss of Signal-Hysteresis	$P_H$	0.5	---	---		
Stressed eye jitter		0.3			UIP-p	BER < 10 <sup>-12</sup>
Receive electrical 3dB upper cutoff frequency				12.3	GHz	
Receiver power				1.5	dBm	
Differential Output Voltage	$V_{DIFF}$	300	---	850	mV	
Single Ended Output Voltage Tolerance		-0.3	---	4	V	
Output Rise and Fall time	$T_r/T_f$	30			ps	20% to 80%
Total Jitter	$T_J$			0.7	UI	
Deterministic Jitter	$D_J$			0.42	UI	

Note 1: Vertical eye closure penalty and stressed eye jitter are the test conditions for measuring stressed receiver sensitivity. They are not the required characteristic of the receiver.

Block Diagram of Transceiver



This 10Gigabit SFP+ BiDi transceiver is designed to transmit and receive optical data over single mode optical fiber for link length 20km.

The SFP+BiDi module electrical interface is compliant to SFI electrical specifications. The transmitter input and receiver output impedance is 100 Ohms differential. Data lines are internally AC coupled. The module provides differential termination and reduce differential to common mode conversion for quality signal termination and low EMI. SFI typically operates over 200 mm of improved FR4 material or up to about 150mm of standard FR4 with one connector.

The transmitter converts 10Gbit/s serial PECL or CML electrical data into serial optical data compliant with the 10GBASE-LR standard. An open collector compatible Transmit Disable (Tx\_Dis) is provided. A logic “1,” or no connection on this pin will disable the laser from transmitting. A logic “0” on this pin provides normal operation. The transmitter has an internal automatic power control loop (APC) to ensure constant optical power output across supply voltage and temperature variations. An open collector compatible Transmit Fault (Tx\_Fault) is provided. TX\_Fault is a module output contact that when high, indicates that the module transmitter has detected a fault condition related to laser operation or safety. The TX\_Fault output contact is an open drain/collector and shall be pulled up to the Vcc\_Host in the host with a resistor in the range 4.7-10 k . TX\_Disable is a module input contact. When TX\_Disable is asserted high or left open, the SFP+ module transmitter output shall be turned off. This contact shall be pulled up to VccT with a 4.7 k to 10 k resistor

The receiver converts 10Gbit/s serial optical data into serial PECL/CML electrical data. An open collector compatible Loss of Signal is provided. Rx\_LOS when high indicates an optical signal level below that specified in the relevant standard. The Rx\_LOS contact is an open drain/collector output and shall be pulled up to Vcc\_Host in the host with a resistor in the range 4.7-10 k , or with an active termination. Power supply filtering is recommended for both the transmitter and receiver. The Rx\_LOS signal is intended as a preliminary indication to the system in which the SFP+ is installed that the received signal strength is below the specified range. Such an indication typically points to non-installed cables, broken cables, or a disabled, failing or a powered off transmitter at the far end of the cable.

Dimensions

