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

Model Number	*Reach*	*Input/Output*	*TX/RX*	*Signal Detect*	*Voltage*	*Temperature*
10G-ESSFP+BIDI-20-27	20 km	AC/AC	1270/1330	TTL	3.3V	0°C to 70 °C
10G-ESSFP+BIDI-20-27-I	20 km	AC/AC	1270/1330	TTL	3.3V	-40°C to 85 °C

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

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Diagnostics Monitoring

Parameter	Accuracy	Unit	Calibration
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

Parameter	Symbol	Min.	Max.	Units	Note
Storage Temperature	T_S	−40	85	°C	
Supply Voltage	*Vcc*	0	3.6	V	
Relative Humidity	*RH*	5	95	%	
RX Input Average Power	*Pmax*	---	0	dBm	

Recommended Operating Conditions

Parameter	Symbol	Min.	Max.	Units	Note
Case Operating Temperature	T_C	0	70	°C	
Supply Voltage	*Vcc*	3.135	3.465	V	
Supply Current	I_{CC}	---	300	mA	

Transmitter Electro-optical Characteristics

***Vcc* = 3.1 V to 3.5 V, T_C = 0 °C to 70 °C (-40 °C to 85 °C)**

Parameter	*Symbol*	*Min.*	*Typ.*	*Max.*	*Units*	*Note*
Data Rate		---	10.3125	---	Gbps	
Output Optical Power	P_{out}	-5.2	---	0.5	dBm	Average
Center Wavelength	λ_C	1265	---	1275	nm	
Side mode Suppression Ratio	SSR_{min}	30			dB	
Relative Intensity Noise	*RIN*	---	---	-128	dB/Hz	12dB reflection
Max. P*out* TX-DISABLE Asserted	P_{OFF}	---	---	-30	dBm	
Extinction Ratio	*ER*	3.5	---	---	dB	
Transmitter Dispersion Penalty	*TDP*	---	---	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	*VI*	180	---	700	mV	
Commonmode voltage tolerance		15	---	---	mV	
TX Fault	*VoL*	-0.3		0.4	V	At 0.7mA
Data Dependent Input Jitter	*DDJ*			0.1	UI	
Data Input Total Jitter	*TJ*			0.28	UI	

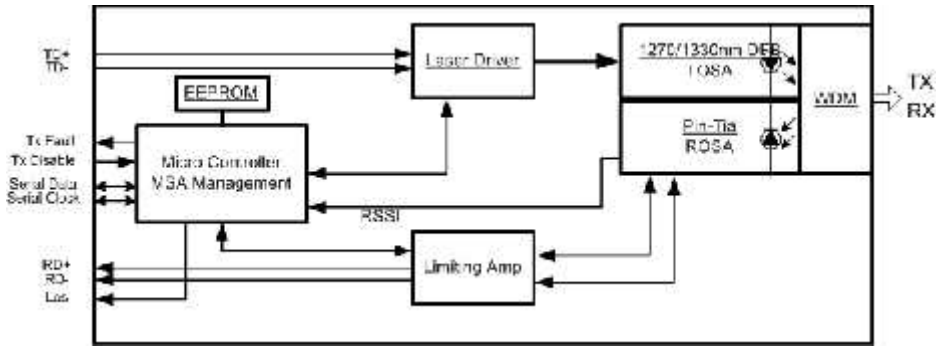
Receiver Electro-optical Characteristics

***Vcc* = 3.1 V to 3.5 V, T_C = 0 °C to 70 °C (-40 °C to 85 °C)**

Parameter	*Symbol*	*Min.*	*Typ.*	*Max.*	*Units*	*Note*
Receiver Sensitivity(	P_{IN}	-12	---	--	dBm	
Operating Center Wavelength	λ_C	1325	---	1335	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^{-12}
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	*Tr/Tf*	30			ps	20% to 80%
Total Jitter	*TJ*			0.7	UI	
Deterministic Jitter	*DJ*			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



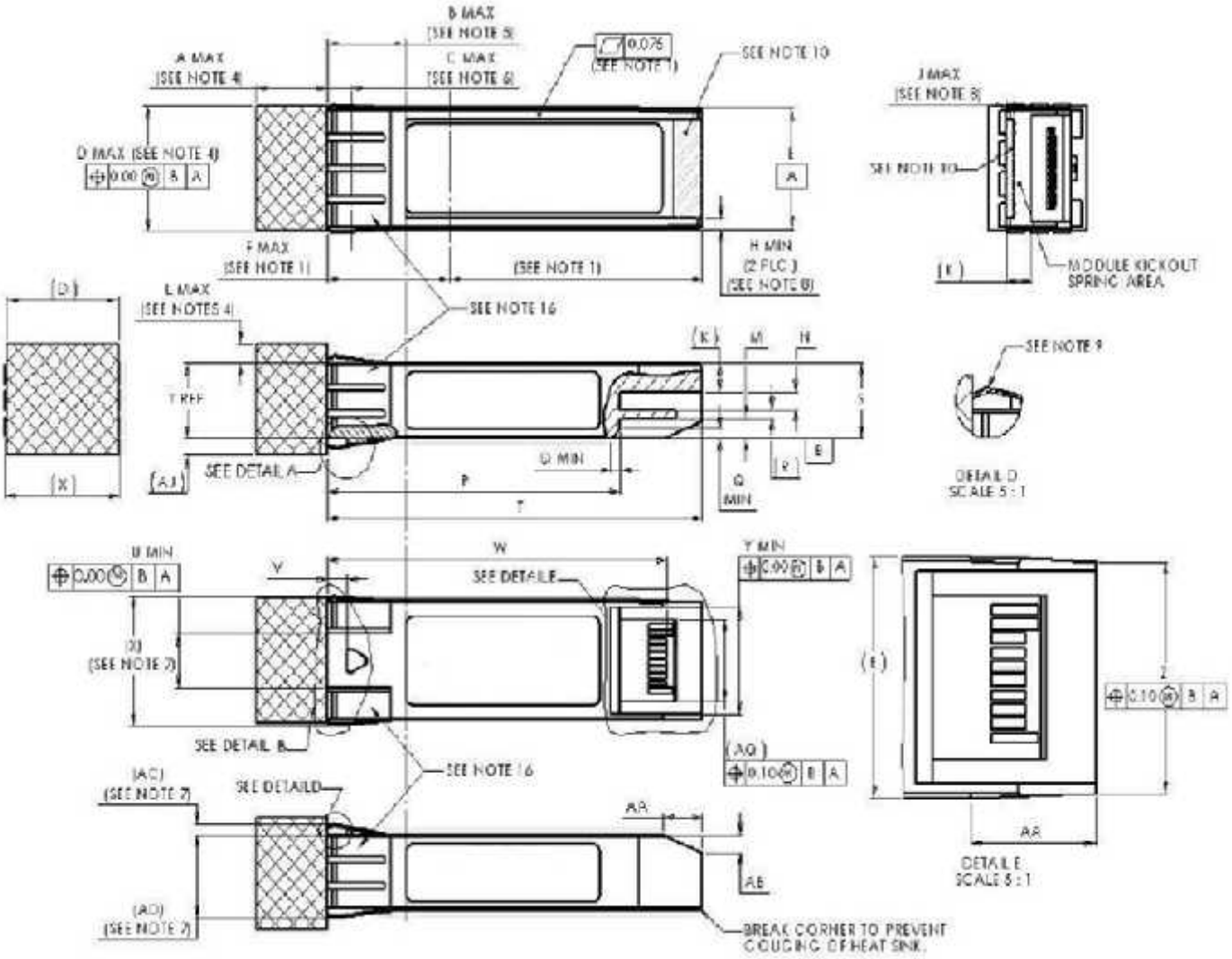
This 10Gigabit SFP+ BiDi transceiver is designed to transmit and receive optical data over single mode optical fiber for link length 20km.

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 kΩ. 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 kΩ to 10 kΩ 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 kΩ, 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


B MAX
(SEE NOTE 5)
A MAX
(SEE NOTE 4)
C MAX
(SEE NOTE 6)
0.076
(SEE NOTE 1)
SEE NOTE 10
D MAX (SEE NOTE 4)
F MAX
(SEE NOTE 11)
(SEE NOTE 1)
H MIN
(2 PLC.)
(SEE NOTE 8)
J MAX
(SEE NOTE 8)
SEE NOTE 10
(K)
MODULE KICKOUT
SPRING AREA
(D)
E MAX
(SEE NOTES 4)
SEE NOTE 16
(K)
M
N
SEE NOTE 9
T REF
SEE DETAIL A
(AJ)
(X)
Q MIN
P
T
Q
MIN
DETAIL D
SCALE 5 : 1
U MIN
V
W
SEE DETAIL C
Y MIN
(J)
(SEE NOTE 7)
SEE DETAIL B
SEE NOTE 16
(AC)
(SEE NOTE 7)
SEE DETAIL D
(AQ)
AA
AB
(AD)
(SEE NOTE 7)
BREAK CORNER TO PREVENT
CHIPPING OF HEAT SINK.
(E)
Z
AR
DETAIL E
SCALE 5 : 1