

10G 10km SFP+ Transceiver

It is a very compact 10Gb/s optical transceiver module for serial optical communication applications at 10Gb/s. it converts a 10Gb/s serial electrical data stream to 10Gb/s optical output signal and a 10Gb/s optical input signal to 10Gb/s serial electrical data streams. The high speed 10Gb/s electrical interface is fully compliant with SFI specification. The high performance 1270~1610nm CWDM DFB transmitter and high sensitivity PIN receiver provide superior performance for Ethernet applications at up to 10km links. The SFP+ Module compliant with SFF-8431, SFF-8432 and IEEE 802.3ae 10GBASE-LR. Digital diagnostics functions are available via a 2-wire serial interface, as specified in SFF-8472. The fully SFP compliant form factor provides hot pluggability, easy optical port upgrades and low EMI emission.

Features:

- ✧ Supports 8.5to 11.3Gb/s bit rates
- ✧ Hot-Pluggable
- ✧ Duplex LC connector
- ✧ 1270~1610nm CWDM DFB transmitter, PIN photo-detector
- ✧ SMF links up to 10km
- ✧ 2-wire interface for management specifications compliant with SFF 8472 digital diagnostic monitoring interface
- ✧ Power Supply :+3.3V
- ✧ Power consumption<1.5W
- ✧ Temperature Range: 0~ 70°C



Applications:

- ✧ 10GBASE-LR/LW Ethernet
- ✧ Sonet OC-192/SDH STM-64
- ✧ 10G Fibre Channel 1200-SM-LL-L

Absolute Maximum Ratings

Parameter	Symbol	Min.	Typical	Max.	Unit
Storage Temperature	TS	-40		+85	°C
Case operating Temperature	TC	0		+70	°C
Supply Voltage	VCCT, R	-0.5		4	V
Relative Humidity	RH	0		85	%

Electrical Characteristics (TOP =Tc, VCC = 3.13 to 3.47 Volts)

Parameter	Symbol	Min.	Typical	Max.	Unit	Note
Supply Voltage	Vcc	3.135		3.465	V	
Supply Current	Icc			380	mA	
Power Consumption	P			1.5	W	
Transmitter Section:						
Input differential impedance	Rin		100		Ω	1
Tx Input Single Ended DC Voltage Tolerance (Ref VeeT)	V	-0.3		4	V	
Differential input voltage swing	Vin,pp	180		700	mV	2
Transmit Disable Voltage	VD	2		Vcc	V	3
Transmit Enable Voltage	VEN	Vee		Vee+0.8	V	
Receiver Section:						
Single Ended Output Voltage Tolerance	V	-0.3		4	V	
Rx Output Diff Voltage	Vo	300		850	mV	
Rx Output Rise and Fall Time	Tr/Tf	30			ps	4
LOS Fault	VLOS fault	2		VccHO ST	V	5
LOS Normal	VLOS norm	Vee		Vee+0.8	V	5

Note:

1. Connected directly to TX data input pins. AC coupling from pins into laser driver IC.
2. Per SFF-8431 Rev 3.0
3. Into 100 ohms differential termination.
4. 20%~80%
5. LOS is an open collector output. Should be pulled up with 4.7k – 10kΩ on the host board. Normal operation is logic 0; loss of signal is logic 1. Maximum pull-up voltage is 5.5V.

Optical Parameters(TOP = Tc, VCC = 3.13 to 3.47 Volts)

Parameter	Symbol	Min	Typ	Max	Unit	Ref.
Transmitter						
Date Rate		8.5	10.3125	11.3	Gb/s	
Optical Wavelength	λ	λ-6.5	λ	λ+6.5	nm	
Average output power	Po	-4		+4	dBm	1
Optical Extinction Ratio	ER	3.5			dB	1
RMS spectral width	Δλ			1	nm	
Optical Modulation Amplitude	OMA	-5.2			dBm	
Side Mode Suppression Ratio	SMSR	30			dB	
Dispersion penalty				3.2	dB	
Optical Eye Mask		IEEE802.3-2005 Compliant Compliant with ITU-T G.691 and GR-253-CORE				

Receiver						
Date Rate		8.5	10.312	11.3	Gb/s	
			5			
Optical Wavelength	λ	1260		1610	nm	
Receiver Sensitivity	R			-14	dBm	2
Stressed Receiver Sensitivity	R1			-10.3	dBm	2
Maximum Input Power	PMAX	0.5			dBm	
LOS De-Assert	LOSD			-15	dBm	
LOS Assert	LOSA	-25			dBm	
LOS Hysteresis		0.5		4	dB	
Receiver Reflectance	Rrx			-12	dB	

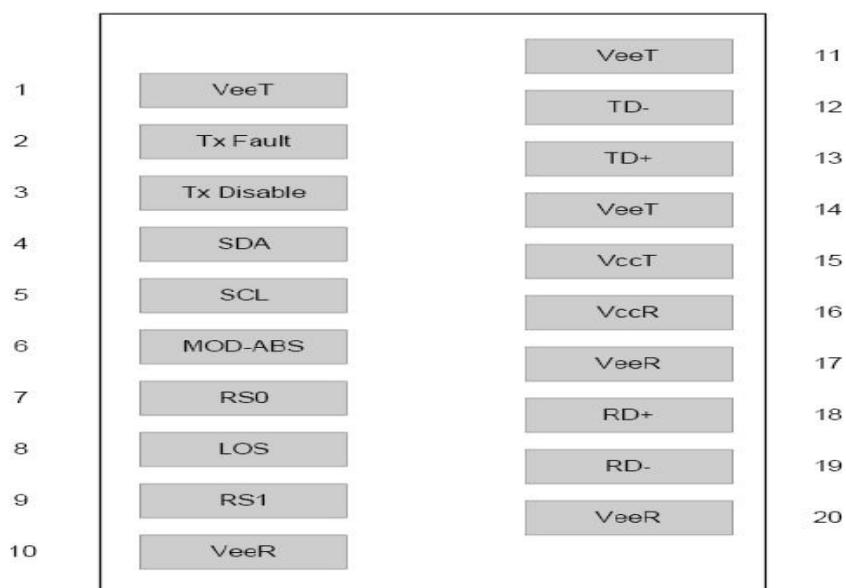
Notes:

Note 1) Measured at 10.3125b/s with PRBS $2^{31} - 1$ NRZ test pattern.

Note 2) Under the ER worst case, measured at 10.3125 Gb/s with PRBS $2^{31} - 1$ NRZ test pattern for BER $< 1 \times 10^{-12}$

Pin Assignment:

Diagram of Host Board Connector Block Pin Numbers and Name



Pin Function Definitions

PIN #	Name	Function	Notes
1	VeeT	Module transmitter ground	Note1
2	Tx Fault	Module transmitter fault	Note 2
3	Tx Disable	Transmitter Disable; Turns off transmitter laser output	Note 3
4	SDL	2 wire serial interface data input/output (SDA)	
5	SCL	2 wire serial interface clock input (SCL)	
6	MOD-ABS	Module Absent, connect to VeeR or VeeT in the module	Note 2
7	RS0	Rate select0,optionally control SFP+ receiver. When high, input data rate >4.5Gb/s;when low, input data rate <=4.5Gb/s	
8	LOS	Receiver Loss of Signal Indication	Note4
9	RS1	Rate select0,optionally control SFP+ transmitter. When high, input data rate >4.5Gb/s;when low, input data rate <=4.5Gb/s	

10	VeeR	Module receiver ground	Note 1
11	VeeR	Module receiver ground	Note 1
12	RD-	Receiver inverted data out put	
13	RD+	Receiver non-inverted data out put	
14	VeeR	Module receiver ground	Note 1
15	VccR	Module receiver 3.3V supply	
16	VccT	Module transmitter 3.3V supply	
17	VeeT	Module transmitter ground	Note 1
18	TD+	Transmitter inverted data out put	
19	TD-	Transmitter non-inverted data out put	
20	VeeT	Module transmitter ground	Note1

Note 1) The module ground pins shall be isolated from the module case.

Note 2) This pin is an open collector/drain output pin and shall be pulled up with 4.7K-10Kohms to Host_Vcc on the host board.

Note 3) This pin shall be pulled up with 4.7K-10Kohms to VccT in the module.

Note 4) This pin is an open collector/drain output pin and shall be pulled up with 4.7K-10Kohms to Host_Vcc on the host board.

SFP Module EEPROM Information and Management

The SFP modules implement the 2-wire serial communication protocol as defined in the SFP -8472. The serial ID information of the SFP modules and Digital Diagnostic Monitor parameters can be accessed through the I2C interface at address A0h and A2h. The memory is mapped in Table 1. Detailed ID information(A0h) is listed in Table 2. And the DDM specification at address A2h. For more details of the memory map and byte definitions, please refer to the SFF-8472, "Digital Diagnostic Monitoring Interface for Optical Transceivers". The DDM parameters have been internally calibrated.

Table 1. Digital Diagnostic Memory Map (Specific Data Field Descriptions)

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

Digital Diagnostic Monitor Characteristics

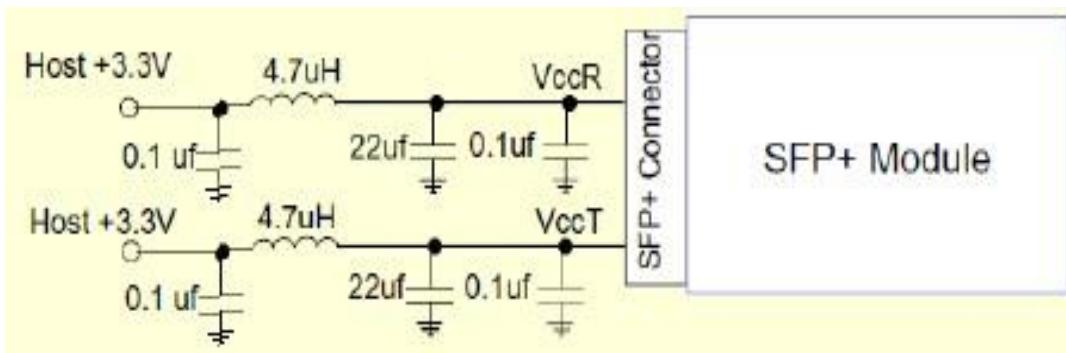
Data Address	Parameter	Accuracy	Unit
96-97	Transceiver Internal Temperature	±3.0	°C
100-101	Laser Bias Current	±10	%
100-101	Tx Output Power	±3.0	dBm
100-101	Rx Input Power	±3.0	dBm
100-101	VCC3 Internal Supply Voltage	±5.0	%

Regulatory Compliance

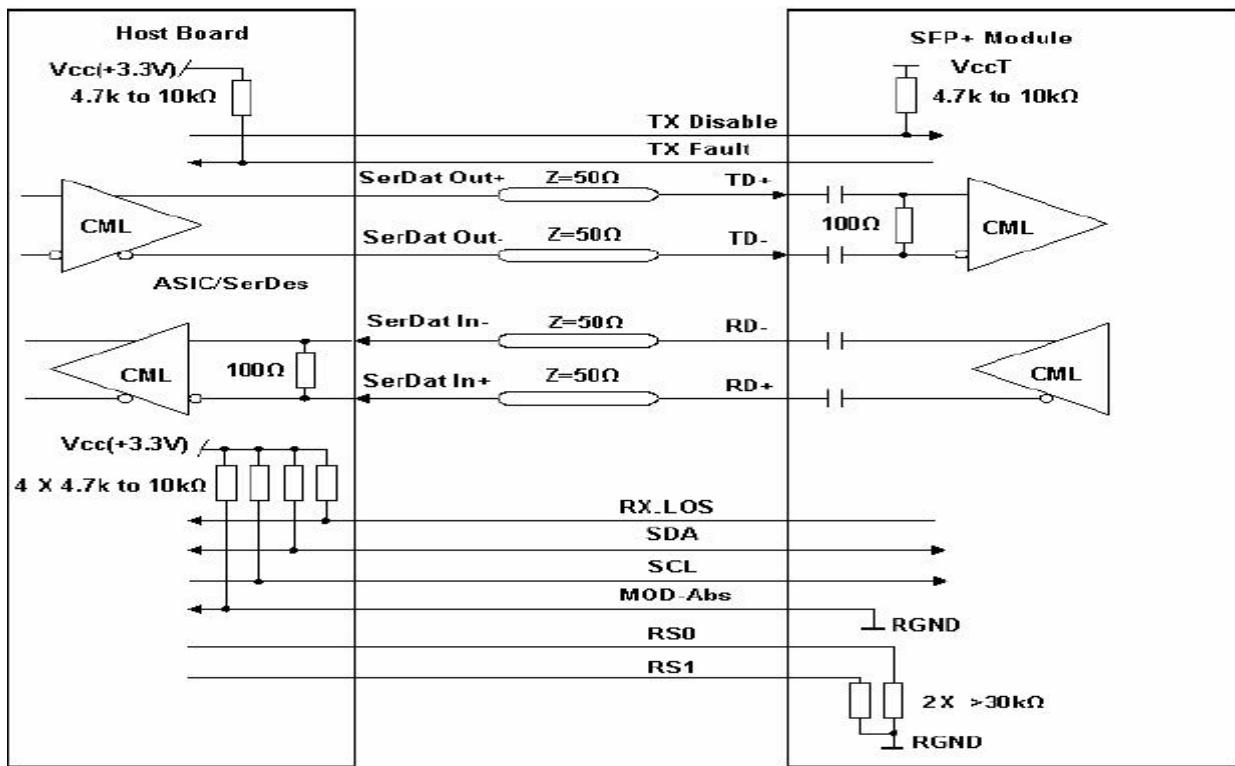
The HXFP-3831MF complies with international Electromagnetic Compatibility (EMC) and international safety requirements and standards (see details in Table following).

Electrostatic Discharge (ESD) to the Electrical Pins	MIL-STD-883E Method 3015.7	Class 1(>1000 V)
Electrostatic Discharge (ESD) to the Duplex LC Receptacle	IEC 61000-4-2 GR-1089-CORE	Compatible with standards
Electromagnetic Interference (EMI)	FCC Part 15 Class B EN55022 Class B (CISPR 22B) VCCI Class B	Compatible with standards
Laser Eye Safety	FDA 21CFR 1040.10 and 1040.11 EN60950, EN (IEC) 60825-1,2	Compatible with Class 1 laser product.

Recommended Circuit:



Recommended Host Board Power Supply Circuit



Recommended High-speed Interface Circuit