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## FIBERER 10Gbps 10km SFP+ SONET Optical Transceiver FPP-31192-LRCS

### Features

- ◆ Optical interface compliant to IEEE 802.3ae/OC192/STM-64
- ◆ Electrical interface compliant to SFFPP-8431
- ◆ Hot Pluggable
- ◆ 1310nm DFB transmitter, PIN photo-detector
- ◆ Dual CDR with 9.95-11.3Gb/s
- ◆ Operating case temperature: 0 to 70 °C
- ◆ Low power consumption
- ◆ Applicable for 10km SMF connection
- ◆ All-metal housing for superior EMI performance
- ◆ Advanced firmware allow customer system encryption information to be stored in transceiver
- ◆ Cost effective SFP+ solution, enables higher port densities and greater bandwidth
- ◆ RoHS6 compliant (lead free) 



### Applications

- ◆ 10G SONET
- ◆ 10G Ethernet
- ◆ 10G Fiber Channel (with/without FEC)

### Product description

This 1310 nm DFB 10Gbps SFP+ SONET transceiver is designed to transmit and receive optical data over single mode optical fiber for link length 10km.

The SFP+ 10km 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.

### Absolute maximum rating

These values represent the damage threshold of the module. Stress in excess of any of the individual



Absolute Maximum Ratings can cause immediate catastrophic damage to the module even if all other parameters are within Recommended Operating Conditions.

Parameters	Symbol	Min.	Max.	Unit
Power Supply Voltage	V <sub>CC</sub>	0	+3.6	V
Storage Temperature	T <sub>c</sub>	-40	+85	°C
Operating Case Temperature	T <sub>c</sub>	0	+70	°C
Relative Humidity	RH	5	95	%
RX Input Average Power	P <sub>max</sub>	-	0	dBm

### Recommended operating environment

Recommended Operating Environment specifies parameters for which the electrical and optical characteristics hold unless otherwise noted.

Parameter	Symbol	Min.	Typical	Max	Unit
Power Supply Voltage	V <sub>CC</sub>	3.135	3.300	3.465	V
Operating Case Temperature	T <sub>c</sub>	0	25	70	°C

### Low Speed Characteristics

Parameter	Symbol	Min.	Typical	Max	Unit
Power Consumption				1	W
TX_Fault,RX_LOS	VOL	0		0.4	V
	VOH	Host_Vcc-0.5		Host_Vcc+0.3	V
TX_DIS	VIL	-0.3		0.8	V
	VIH	2.0		VCCT+0.3	V
RS0,RS1	VIL	-0.3		0.8	V
	VIH	2.0		VCCT+0.3	V

## Optical characteristics

The following optical characteristics are defined over the Recommended Operating Environment unless otherwise specified.

### Transmitter Specifications – Optical

Parameter	Symbol	Min	Typical	Max	Unit
Center Wavelength	$\lambda_c$	1260		1355	nm
Spectral Width (-20dB)	$\Delta \lambda_{20}$	-	-	0.3	nm
Average Optical Power	Po	-8	-	+0.5	dBm
Optical Power in OMA	OMA	-2.1			dBm
Side Mode Suppression Ratio	SMSR	30	-	-	dB
Optical Transmit Power (disabled)	PTX_DISABLE	-	-	-30	dBm
Extinction Ratio	ER	3.5	-	-	dB
Tx Jitter Generation(peak-to-peak)	TXJ			0.1	UI
Tx Jitter Generation(RMS)	TXJRMS			0.01	UI
Relative Intensity Noise	RIN	-	-	-128	dB/Hz
Optical Return Loss Tolerance	Orl	-	-	21	dB

### Receiver Specifications – Optical

Parameter	Symbol	Min	Typical	Max	Unit
Input Operating Wavelength	$\lambda$	1260	-	1600	nm
Average receive power	Pavg	-15.8	-	-1.0	dBm
Receiver sensitivity in 9.953Gbps(OMA)	Rsen1	-	-	-14.1	dBm
Stressed receiver sensitivity in 9.953Gbps(OMA)	Rsen2	-	-	-11.3	dBm
Reflectance	Rrx	-	-	-26	dB
LOS Asserted	Lsa	-28	-	-	dBm
LOS De-Asserted	Lda	-	-	-19	dBm
LOS Hysteresis	Lh	0.5	-	-	dB

#### Notes:

[1] Measured with conformance test signal for BER =  $10^{-12}$ . The stressed sensitivity values in the table are for system level BER measurements which include the effects of CDR circuits.

## Electrical characteristics

The following electrical characteristics are defined over the Recommended Operating Environment unless otherwise specified.



Parameter	Symbol	Min.	Typical	Max	Unit	Notes
Data Rate		-	9.953	-	Gbps	
Power Consumption		-		1200	mW	
<b>Transmitter</b>						
Single Ended Output Voltage Tolerance		-0.3	-	4.0	V	
C common mode voltage tolerance		15	-	-	mV	
Tx Input Diff Voltage	VI	400		1600	mV	
Tx Fault	VoL	-0.3		0.4	V	At 0.7mA
Tx Jitter Generation(peak-to-peak)	TXJ			0.10	UI	
Tx Jitter Generation(RMS)	TXJRMS			0.01	UI	
<b>Receiver</b>						
Single Ended Output Voltage Tolerance		-0.3	-	4.0	V	
Rx Output Diff Voltage	Vo	300		850	mV	
Rx Output Rise and Fall Time	Tr/Tf	30			ps	20% to 80%

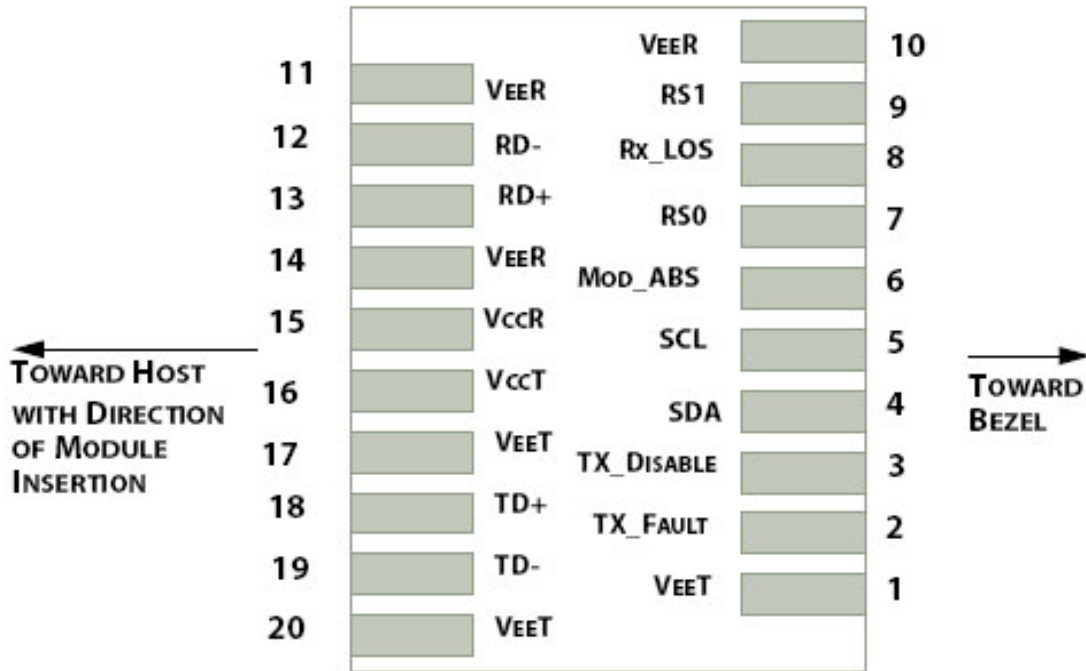


Figure 1: Interface to Host PCB

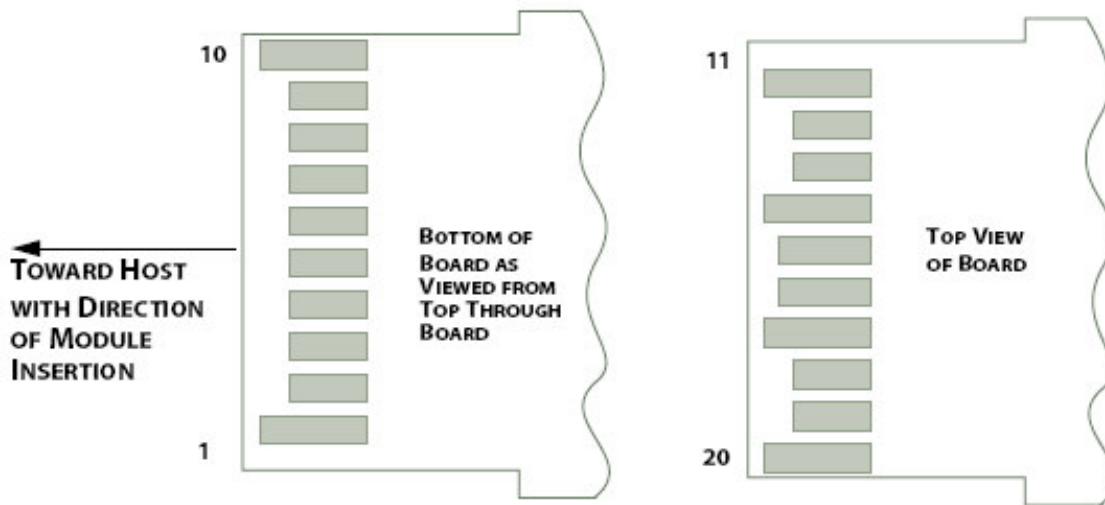


Figure 2: Module Contact Assignment

Pin definition



Pin	Symbol	Name/Description
1	VEET [1]	Transmitter Ground
2	Tx_FAULT [2]	Transmitter Fault
3	Tx_DIS [3]	Transmitter Disable. Laser output disabled on high or open
4	SDA [2]	2-wire Serial Interface Data Line
5	SCL [2]	2-wire Serial Interface Clock Line
6	MOD_ABS [4]	Module Absent. Grounded within the module
7	RS0 [5]	Rate Select 0
8	RX_LOS [2]	Loss of Signal indication. Logic 0 indicates normal operation
9	RS1 [5]	Rate Select 1
10	VEER [1]	Receiver Ground
11	VEER [1]	Receiver Ground
12	RD-	Receiver Inverted DATA out. AC Coupled
13	RD+	Receiver DATA out. AC Coupled
14	VEER [1]	Receiver Ground
15	VCCR	Receiver Power Supply
16	VCCT	Transmitter Power Supply
17	VEET [1]	Transmitter Ground
18	TD+	Transmitter DATA in. AC Coupled
19	TD-	Transmitter Inverted DATA in. AC Coupled
20	VEET [1]	Transmitter Ground

**Notes:**

[1] Module circuit ground is isolated from module chassis ground within the module.

[2].should be pulled up with 4.7k – 10k ohms on host board to a voltage between 3.15V and 3.6V.

[3]Tx\_Disable is an input contact with a 4.7 kΩ to 10 kΩ pullup to VccT inside the module.

[4]Mod\_ABS is connected to VeeT or VeeR in the SFP+ module. The host may pull this contact up to Vcc\_Host with a resistor in the range 4.7 kΩ to 10 kΩ. Mod\_ABS is asserted “High” when the SFP+ module is physically absent from a host slot.

[5] RS0 and RS1 are module inputs and are pulled low to VeeT with > 30 kΩ resistors in the module.

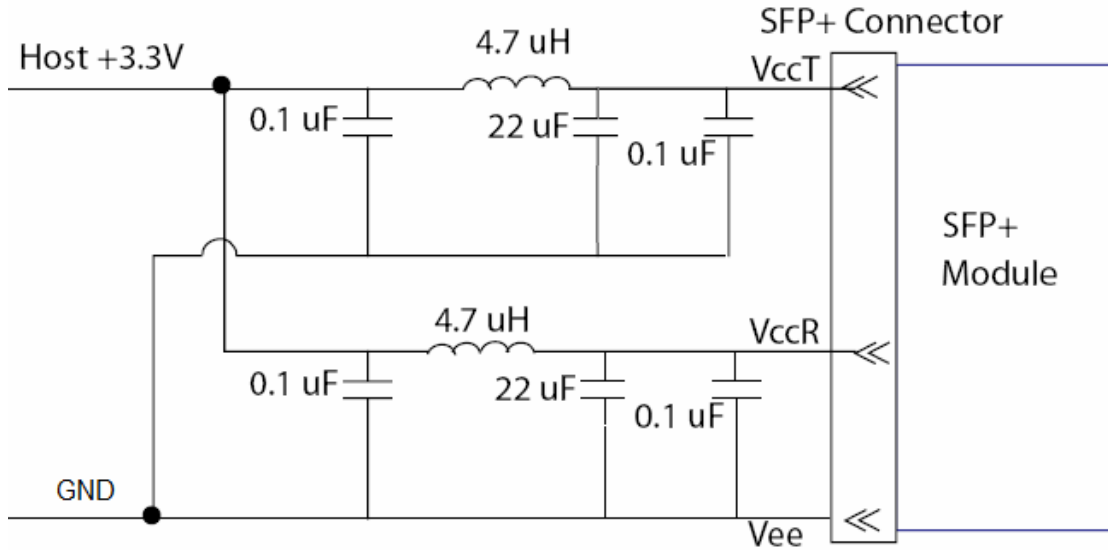


Figure3. Host Board Power Supply Filters Circuit

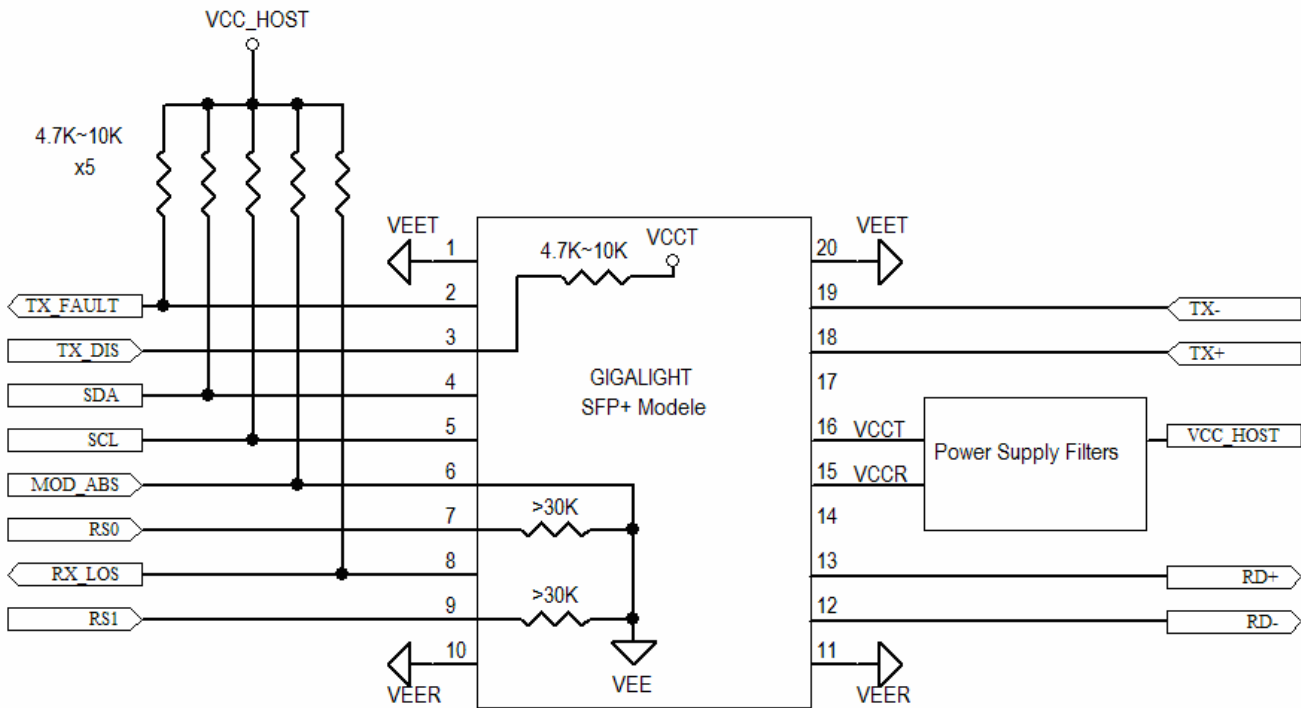
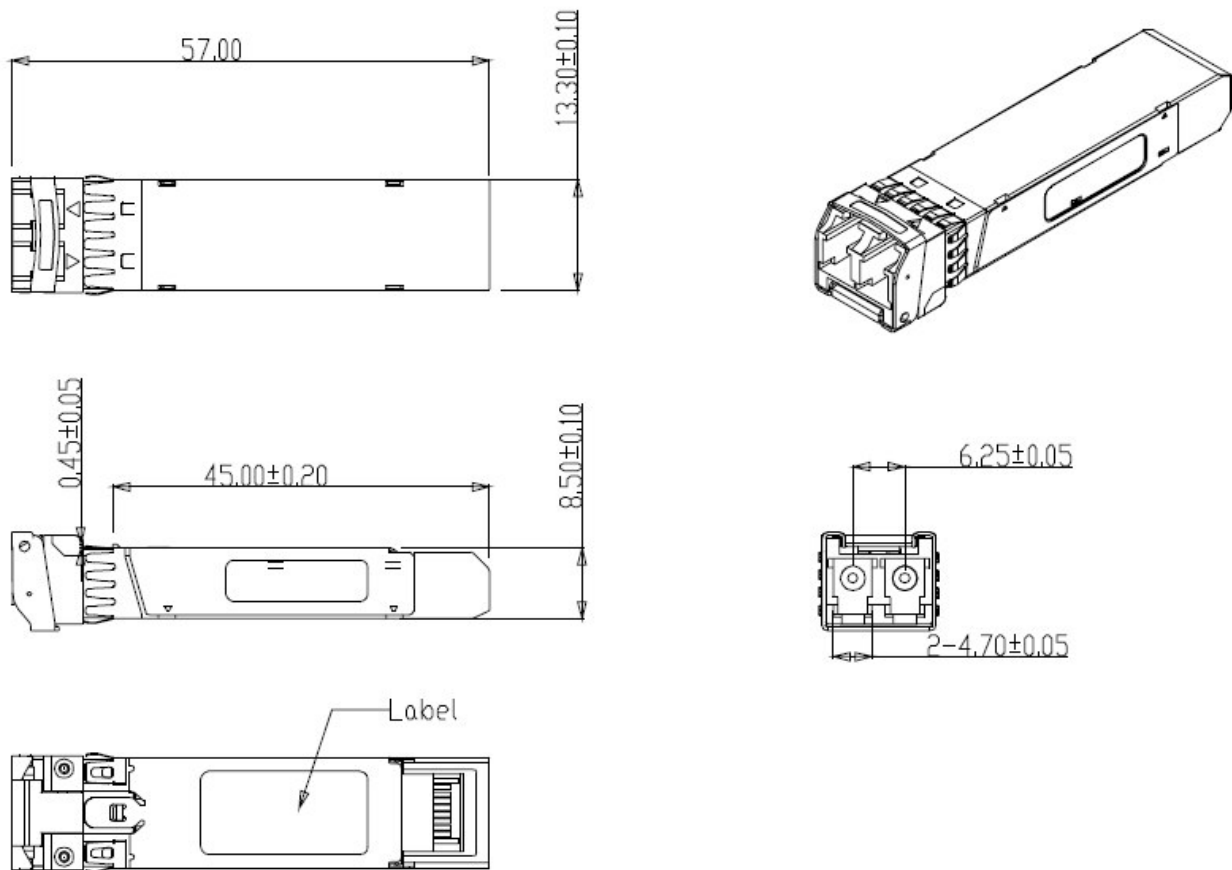


Figure4. Host-Module Interface



**Figure5. Mechanical Specifications**

## Regulatory Compliance

FIBERER SFP+ transceiver is designed to be Class I Laser safety compliant and is certified per the following standards:

Feature	Agency	Standard	Certificate / Comments
Laser Safety	FDA	CDRH 21 CFR 1040 annd Laser Notice No. 50	1120292-000
Product Safety	UL	UL and CUL EN60950-2:2007	E347511
Environmental protection	SGS	RoHS Directive 2002/95/EC	GZ1001008918/CHEM
EMC	WALTEK	EN 55022:2006+A1:2007 EN 55024:1998+A1+A2:2003	WT10093759-D-E-E

## Ordering information





Part Number	Product Description
FPP-31192-LRCS	1310nm, 10Gbps, SFP+SONET 10km, 0°C ~ +70°C

## References

1. "Specifications for Enhanced Small Form Factor Pluggable Module SFP+", SFFPP-8431, Rev 4.1, July 6, 2009.
2. "Improved Pluggable Formfactor", SFFPP-8432, Rev 4.2, Apr 18, 2007
3. IEEE802.3ae – 2002
4. "Diagnostic Monitoring Interface for Optical Transceivers" SFFPP-8472, Rev 10.3, Dec 1, 2007

## Important Notice

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