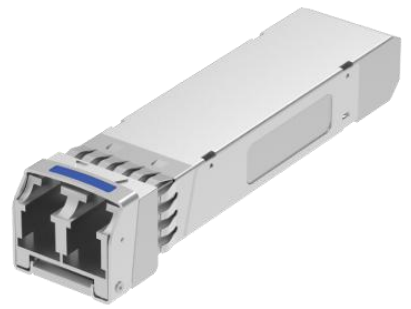
10GE SFP+ LR 1310nm 10km Optical Transceiver Module (I-Temp)

FST-10G-LR-I

Features

- Supports rate from 1.25 Gb/ to 11.3 Gb/s bit rates
- Optical interface compliant to IEEE 802.3ae
- Electrical interface compliant to SFF-8431
- Hot Pluggable SFP+ form factor
- 1310nm DFB transmitter, PIN photo-detector
- Operating case temperature: -40°C to +85 °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

- 10GBASE-LR at 10.3125Gbps
- Other optical links

Product description

This 1310 nm DFB 10Gbps SFP+ 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 150mmof 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	VCC	0	+3.6	V
Storage Temperature	Tc	-40	+85	°C
Operating Case Temperature	Tc	-40	+85	°C
Relative Humidity	RH	5	95	%
RX Input Average Power	Pmax	-	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	VCC	3.135	3.300	3.465	V
Operating Case Temperature	TC	-40	25	+85	°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.

	Unit	Values
Operating Reach	m	10Km
Transmit		
Center wavelength (range)	nm	1260 -1355
Side Mode Suppression Ratio (min)	dB	30
Launched power		
– maximum	dBm	+0.5
– minimum	dBm	-8.2 Notes1
OMA	dBm	-5.2
OMA-TDP (min)	dBm	-6.2
Transmitter and dispersion penalty	dB	0 Notes4
Average launch power of OFF transmitter (max)	dBm	-30
Extinction ratio (min)	dB	3.5 Notes2
RIN12 OMA (max)	dB/Hz	-128
Optical Return Loss Tolerance (min)	dB	12
Receiver		
Center wavelength (range)	nm	1260~1610nm
Receive overload (max) in average power1	dBm	0.5
Receive sensitivity (min) in average power1	dBm	-14.4 Notes3
Receiver sensitivity (max) in OMA (footnote 2)	dBm	-12.6 Notes3
Receiver Reflectance (max)	dB	-12
Stressed receiver sensitivity (max) in OMA2	dBm	-10.3
Vertical eye closure penalty (min)3	dB	2.2

Stressed eye jitter (min)2	UIp-p	0.7
Receive electrical 3dB upper cutoff frequency (max)	GHz	12.3
Receiver power (damage, Max)	dBm	1.5

Notes:
The optical power is launched into SMF
Measured with a PRBS 231-1 test pattern@10.3125Gbps
Measured with a PRBS 231-1 test pattern@10.3125Gbps BER≤10-12
4. In G.652 and G.655(NDSF)

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		1.250	10.3125	11.3	Gbps	
Power Consumption		-		1000	mW	
Transmitter						
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
Data Dependent Input Jitter	DDJ			0.10	UI	
Data Input Total Jitter	TJ			0.28	UI	
Receiver						
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%
Total Jitter	TJ			0.70	UI	
Deterministic Jitter	DJ			0.42	UI	

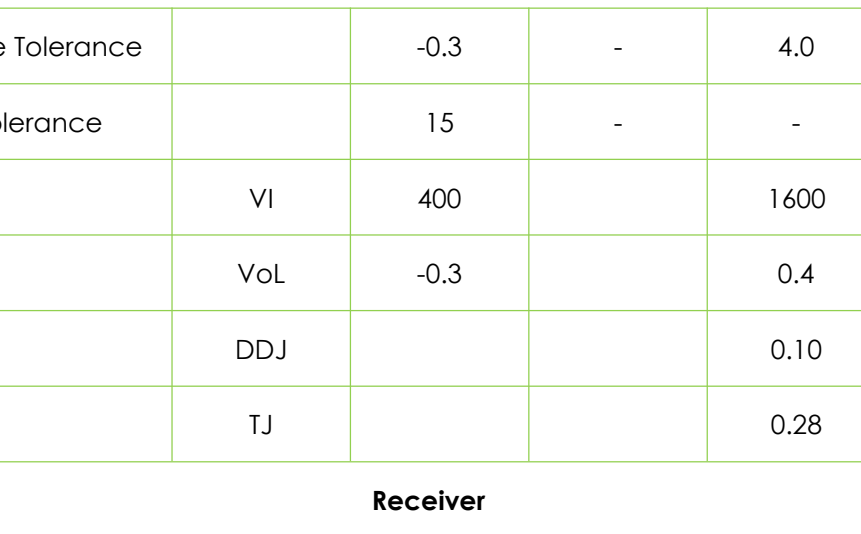


Figure 1: Interface to Host PCB

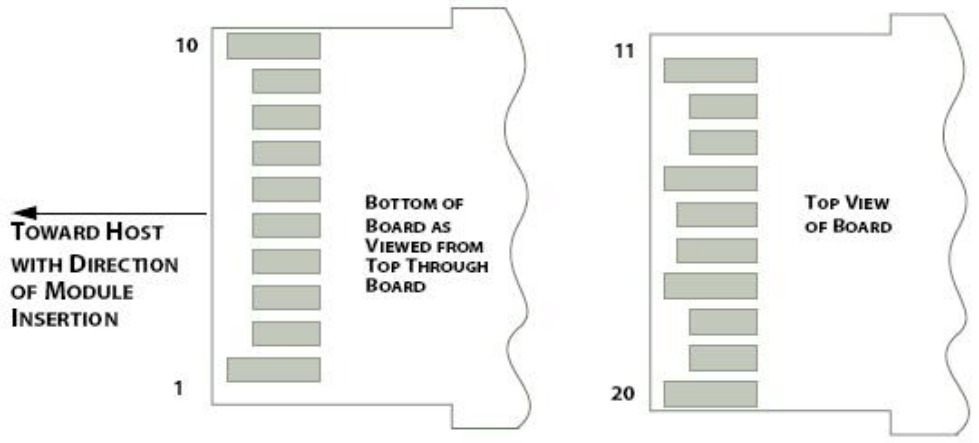


Figure 2: Module Contact Assignment

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 3.15Vand 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 to10 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.

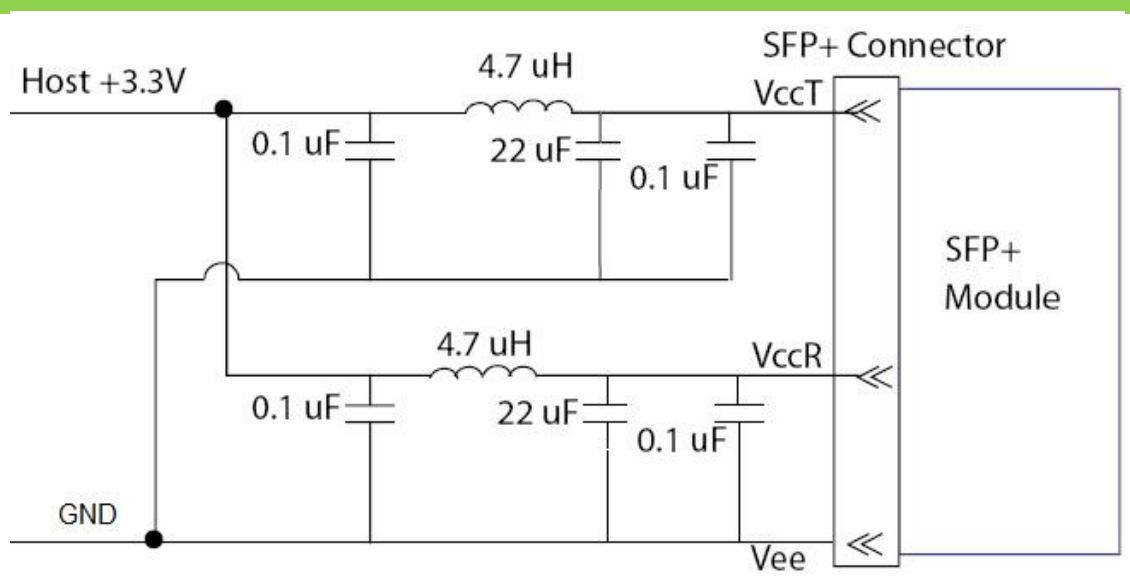


Figure3. Host Board Power Supply Filters Circuit

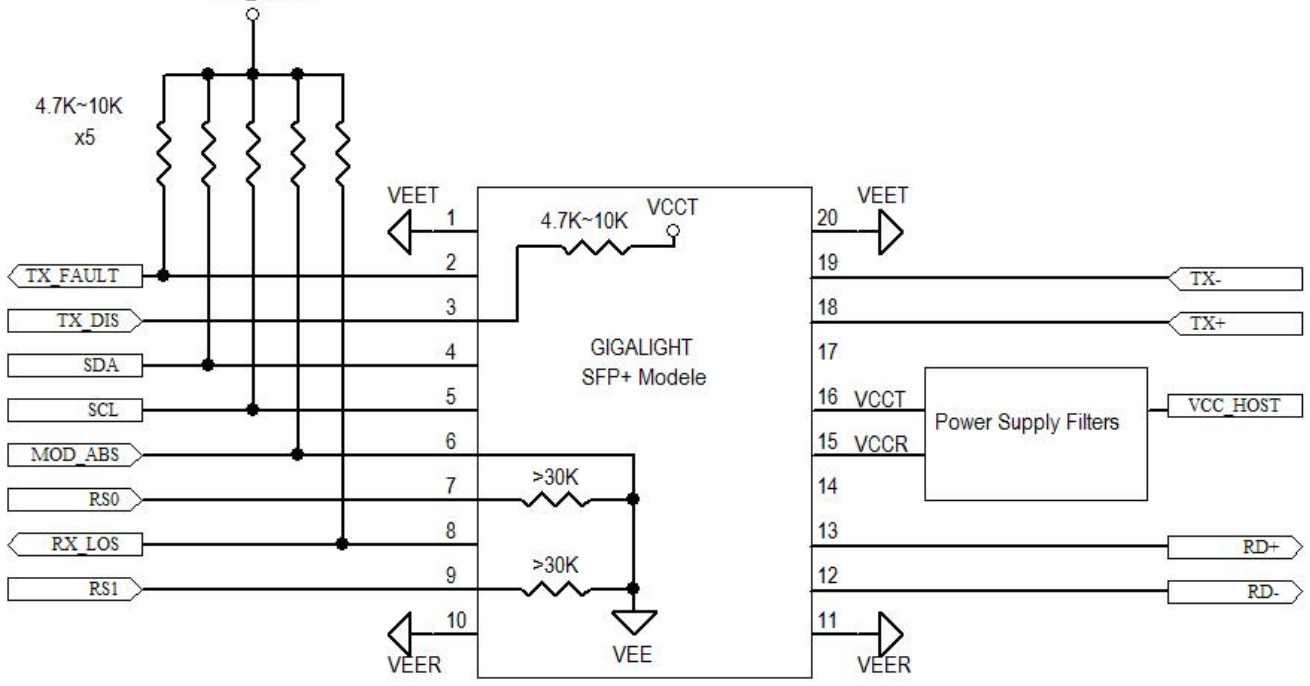


Figure4. Host-Module Interface

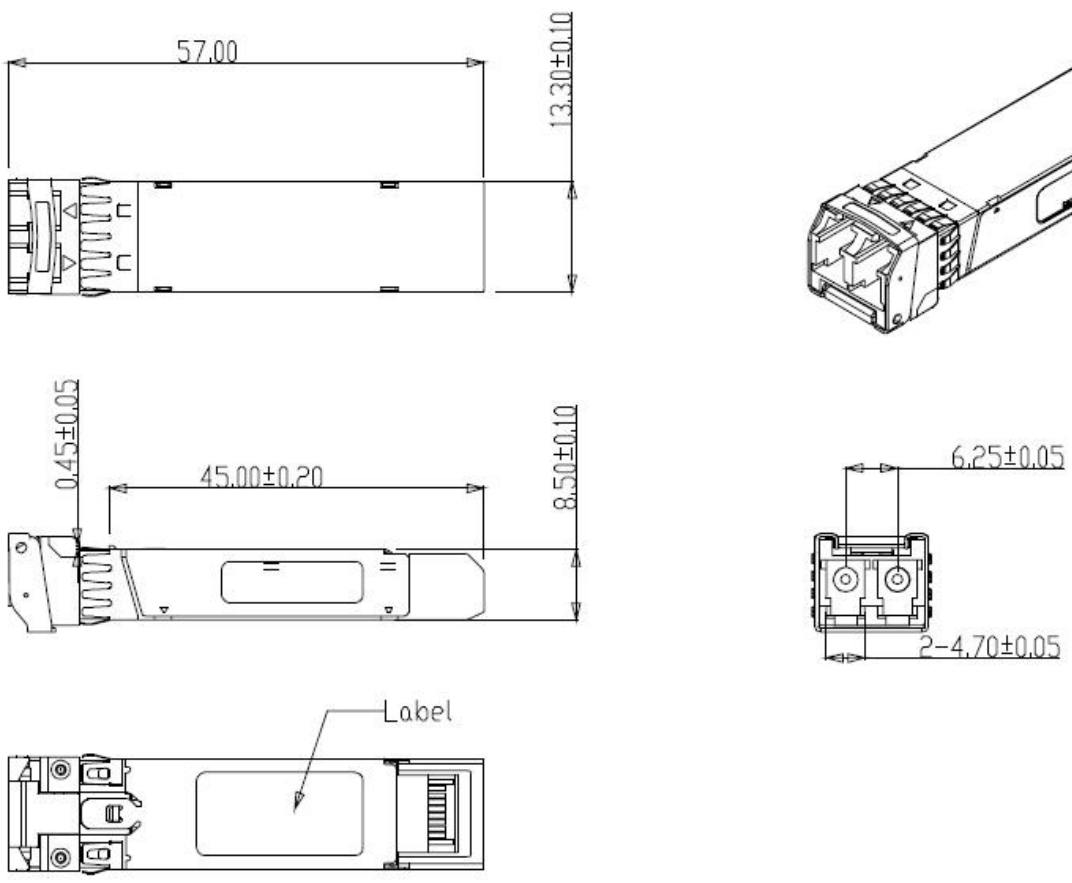


Figure5. Mechanical Specifications

Regulatory Compliance

FIBERSTAMP 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

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Standard EEPROM Serial ID Memory Contents

A0 EEPROM Definition					
Data Addr	Field Size (Byte)	Name Of filed	Description of field	Coded value	Hex
0	1	Identifier	Type of serial transceiver	SFP	03
1	1	Ext.Identifier	Extended identifier of type of serial transceiver	MOD_DEF4	04
2	1	Connector	Code for connector type	LC	07
3	8	Transceiver	Infiniband compliance codes	10GBase-LR	20
4			Part of SONET compliance codes		00
5			SONET compliance codes		00
6			Gigabit ethernet compliance codes		00
7			Fiber channel link length & part of transmitter technology		12
8			Part of fiber channel transmitter technology		00
9			Fiber channel transmission media	SM	1
10			Fiber channel speed	0	00
11	1	Encoding	Code for serial encoding algorithm	64B/66B	06
12	1	BR, Nominal	Nominal bit rate,units of 100 Mbits/sec.	10.3G	67
13	1	Reserved	Reserved	Unspecified	00
14	1	Length (9um)	Link length supported for 9/125 um fiber, units of km	10km	0A
15	1	Length (9um)	Link length supported for 9/125 um fiber, units of 100 m	1000m	64
16	1	Length (50um)	Link length supported for 50/125 um fiber, units of 10 m	0m	00
17	1	Length (62.5um)	Link length supported for 62.5/125 um fiber, units of 10 m	0m	00
18	1	Length (Copper)	Link length supported for copper or direct attach cable, units of m	0m	00
19	1	Length (50um)	Link length supported for 50 um OM3 fiber, units of 10 m	0m	00
20	16	Vendor name	Vendor name (ASCII)	FIBERSTAMP	47
21					69
22					67
23					61
24					6c
25					69
26					67
27					68
28					74
29					20
30					20
31					20

A0 EEPROM Definition					
Data Addr	Field Size (Byte)	Name Of filed	Description of field	Coded value	Hex
32					20
33					20
34					20
35					20
36	1	Reserved	Reserved	Reserved	00
37	3	Vendor OUI	Vendor IEEE company ID		24
38					00
39					00
40	16	Vendor PN	Part number provided by vendor (ASCII)	FST-10G-LR-I	47
41					50
42					50
43					2d
44					33
45					31
46					31
47					39
48					32
49					2d
50					4c
51					52
52					54
53					20
54					20
55					20
56	4	Vendor rev	Revision level for part number provided by vendor (ASCII)	1.0	31
57					2E
58					30
59					20
60	2	Wavelength	Laser wavelength	1310nm	05
61					1E
62	1	Reserved	Reserved	Reserved	00
63	1	CC_BASE	The sum of all the bytes from byte 0 to byte 62	checksum	xx
64	2	Options	Indicates which optional transceiver signals are implemented	Rx_LOS TX_FAULT TX_DISABLE	00
65					1A
66	1	BR, max	Upper bit rate margin, units of %	0%	00

A0 EEPROM Definition					
Data Addr	Field Size (Byte)	Name Of filed	Description of field	Coded value	Hex
67	1	BR, min	Lower bit rate margin, units of %	0%	00
68	16	Vendor SN	Serial number provided by vendor (ASCII)	SN	47
69					4C
70					31
71					37
72					30
73					32
74					30
75					37
76					30
77					30
78					30
79					31
80					20
81					20
82					20
83					20
84	8	Date code	Vendor's manufacturing date code	Year	31
85				Year	39
86				Month	30
87				Month	36
88				Day	30
89				Day	35
90				<space>	20
91				<space>	20
92	1	Diagnostic Monitoring Type	Compliant with SFF-8472 V9.5 Externally Calibrated Received power measurement type-Average Power	Average power Internally calibrated Digital diagnostic monitoring implemented	68
93	1	Enhanced Options	Diagnostics (Optional Alarm/warning flags) Soft TX_FAULT monitoring implemented Soft RX_LOS monitoring implemented	Optional Alarm/warning flags implemented for all monitored quantities;	F0
94	1	SFF-8472 Compliance	Diagnostics Compliance(SFF-8472 V9.5)	Rev 10.2 of SFF-8472	01

A0 EEPROM Definition					
Data Addr	Field Size (Byte)	Name Of filed	Description of field	Coded value	Hex
95	1	CC_EXT	The sum of all the bytes from byte 64 to byte 94	checksum	xx
96	32	Vendor Specific	Vendor Specific EEPROM		00
97					00
98					00
99					00
100					00
101					00
102					00
103					00
104					00
105					00
106					00
107					00
108					00
109					00
110					00
111					00
112					00
113					00
114					00
115					00
116					00
117					00
118					00
119					00
120					00
121					00
122					00
123					00
124					00
125					00
126					00
127					00

Ordering information

Part Number	Product Description
FST-10G-LR-I	1310nm, up to 11.3Gbps, SFP+ 10km,-40°C ~ +85°C

References

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

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