

## Description

### General

The SFG10-L01-I is small form factor pluggable module with standard LC duplex connector for fiber communications. This module is designed for single mode fiber and operates at a nominal wavelength of 1310 nm with cost effective and high performance. It is with the SFP 20-pin connector to allow hot plug capability.

### Transmitter Section

The transmitter consists of a high-performance 1310 nm DFB laser, which is housed within a metal package. In addition, this component is also class 1 laser compliant with according to International Safety Standard IEC-60825

### Receiver Section

The receiver section uses an integrated InGaAs detector preamplifier (IDP) mounted in an optical header and a limiting post-amplifier IC.

## Features

- Small Form Factor Pluggable MSA Compliant
- Linking Distance up to 10 km
- Compliant with IEEE 802.3ae 10GBASE-LR/LW
- Compliant with MSA SFP+ Specification SFF-8431
- TTL Signal Detect Indicator
- For Single Mode Applications
- LC Duplex Connector
- Single + 3.3 V power Supply
- Class 1 Laser Safety Standard IEC 60825
- Temperature: 0 to 70°C or -40 to +85°C (Industrial)
- RoHS Compliant

## Applications

- 10GBASE-LR at 10.31Gbps
- 10GBASE-LW at 9.95Gbps
- OBSAI rates 6.144 Gb/s, 3.072 Gb/s, 1.536 Gb/s, 0.768Gb/s
- CPRI rates 10.138Gb/s ,9.830 Gb/s,7.373Gb/s, 6.144 Gb/s, 4.915 Gb/s, 2.458 Gb/s, 1.229 Gb/s, 0.614Gb/s

## General Specifications

Parameter	Symbol	Min	Typ	Max	Unit
Power Supply Voltage	V <sub>CC</sub>	-3.15	3.3	3.45	V
Power Supply Current	I <sub>CC</sub>	-	-	300	mA
Surge Current	I <sub>Surge</sub>	-	-	+30	mA
Operating Temperature (Industrial)	T <sub>OPI</sub>	-40	-	+85	°C
Storage Temperature	T <sub>S</sub>	-40	-	+85	°C
Data Rate	B	0.6	-	11.3	Gbps
Supported Link Length on 9/125μm SMF	L	-	10	-	Km

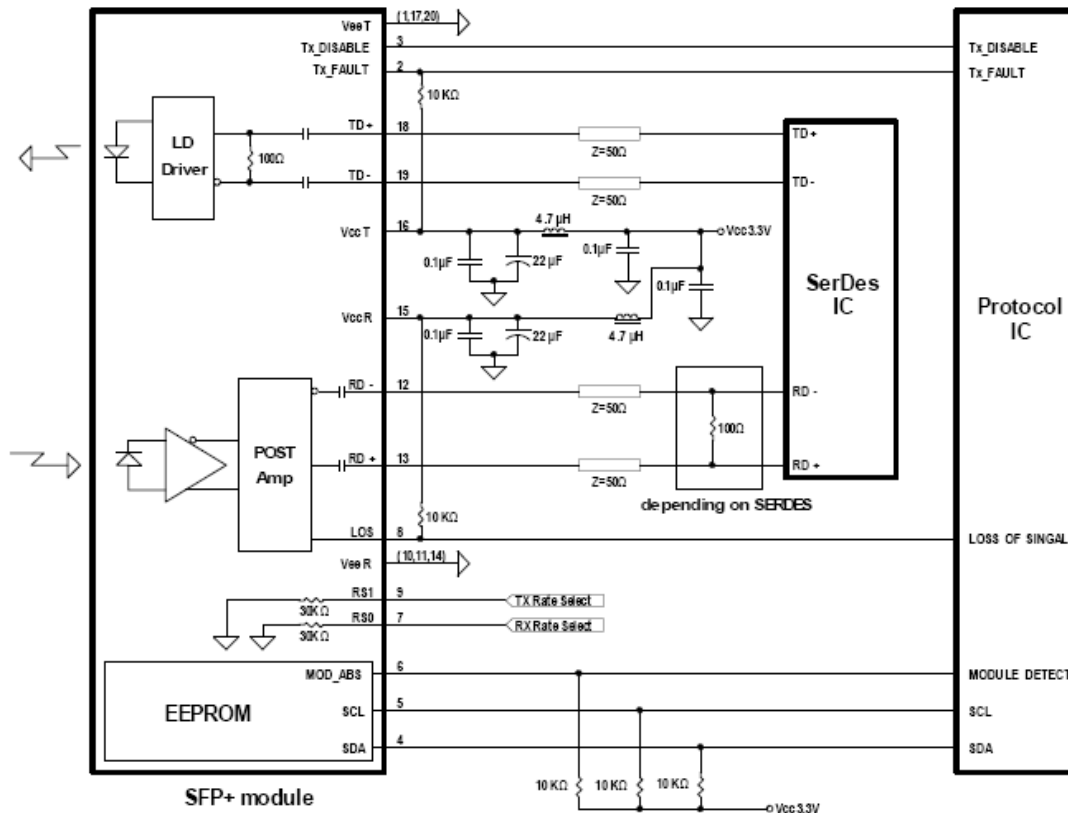
## Order Information

Models	P/No.	Bit Rate (Gbps)	Distance (km)	Wavelength (nm)	Fiber Single/Dual	Package	Temp (°C)	TX Power (dBm)	RX Sens. (dBm)	DMI
SFG10-L01-I	NS3110-10-I	10.31	10	1310	Dual	LC SFP	-40 to 85	-8.2 to +0.5	-22	Yes

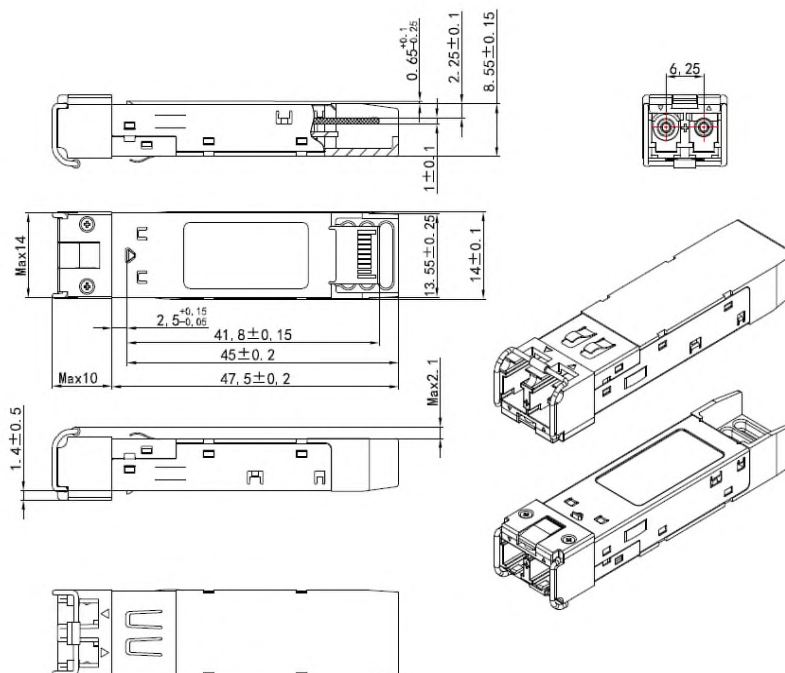
## Optical and Electrical Characteristics

Transmitter Electrical Characteristics					
Parameter	Symbol	Min	Typ	Max	Unit
CML Inputs (Differential)	$V_{in}$	150	-	1200	mVpp
Input AC Common Mode Voltage		0	-	25	RMS
Input Impedance (Differential)	$Z_{in}$	85	100	115	ohm
Differential Input S-parameter	$S_{DD11}$	-		-10	dB
Differential to Common Mode Conversion	$S_{CD11}$	-		-10	dB
Tx_DISABLE Input Voltage – High		2		3.45	V
Tx_DISABLE Input Voltage – Low		0		0.8	V
Tx_FAULT Output Voltage – High		2		$V_{CC}+0.3$	V
Tx_FAULT Output Voltage – Low		0		0.5	V
Transmitter Optical Characteristics					
Average Output Power*	$P_{Out}$	-8.2	-	+0.5	dBm
Center Wavelength	$\lambda_C$	1270	1310	1355	nm
Spectral Width (-20dB)	$\Delta\lambda$	-	-	1	nm
Extinction Ratio	ER	3.5			dB
Average Power of OFF Transmitter	$P_{off}$			-30	dBm
Transmitter Dispersion Penalty	TDP	-	-	3.2	dB
Side Mode Suppression Ratio	SMSR	30	-	-	dB
TX Disable Assert Time	$t_{off}$	-	-	10	us
TX Disable Negate Time	$t_{on}$	-	-	1	us
TX Disable time to start reset	$t_{reset}$	10	-	-	us
Time to initialize, include reset of TX Fault	$t_{init}$	-	-	300	ms
TX_FAULT from fault to assertion	$t_{fault}$	-	-	100	us
Receiver Electrical Characteristics					
CML Outputs (Differential)	$V_{out}$	350	-	700	mVpp
Output AC Common Mode Voltage		0	-	15	RMS
Output Impedance (Differential)	$Z_{out}$	90	100	110	ohm
Differential Output S-parameter	$S_{D22}$	-	-	-10	dB
Rx_LOS Output Voltage – High		2		$V_{CC}+0.3$	V
Rx_LOS Output Voltage – Low		0		0.8	V
MOD_DEF ( 0:2 )	$V_{oH}$	2.5			V
	$V_{oL}$	0		0.5	V
Receiver Optical Characteristics					
Sensitivity	$P_{min}$			-14.4	dBm
Center Wavelength	$\lambda$	1260		1565	nm
Receiver Overload	$P_{max}$	0.5			dBm
Optical Return Loss	ORL			-12	dB
LOS De-Assert	$LOS_D$			-16	dBm
LOS Assert	$LOS_A$	-28			dB

## Recommended Circuit Schematic

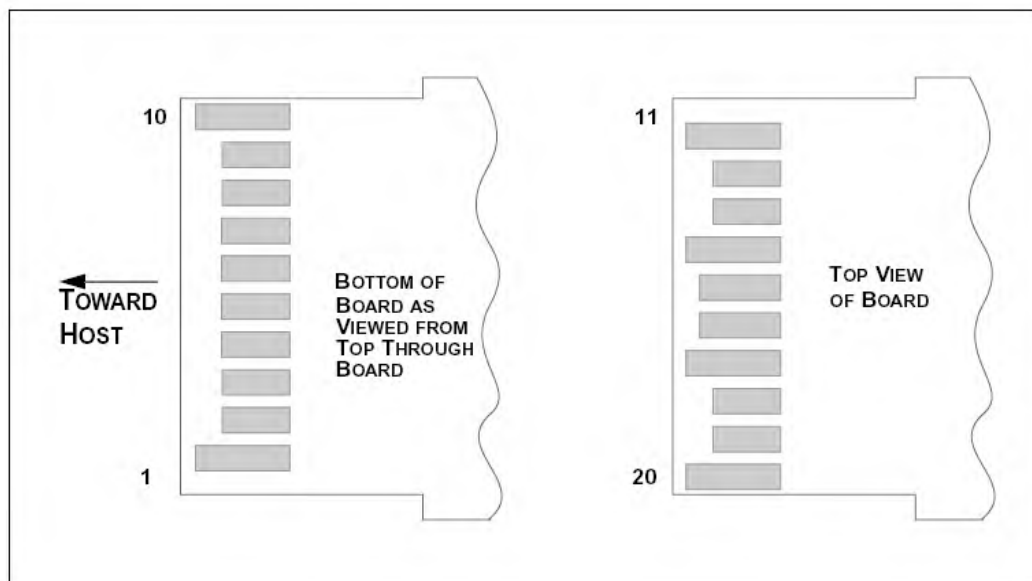
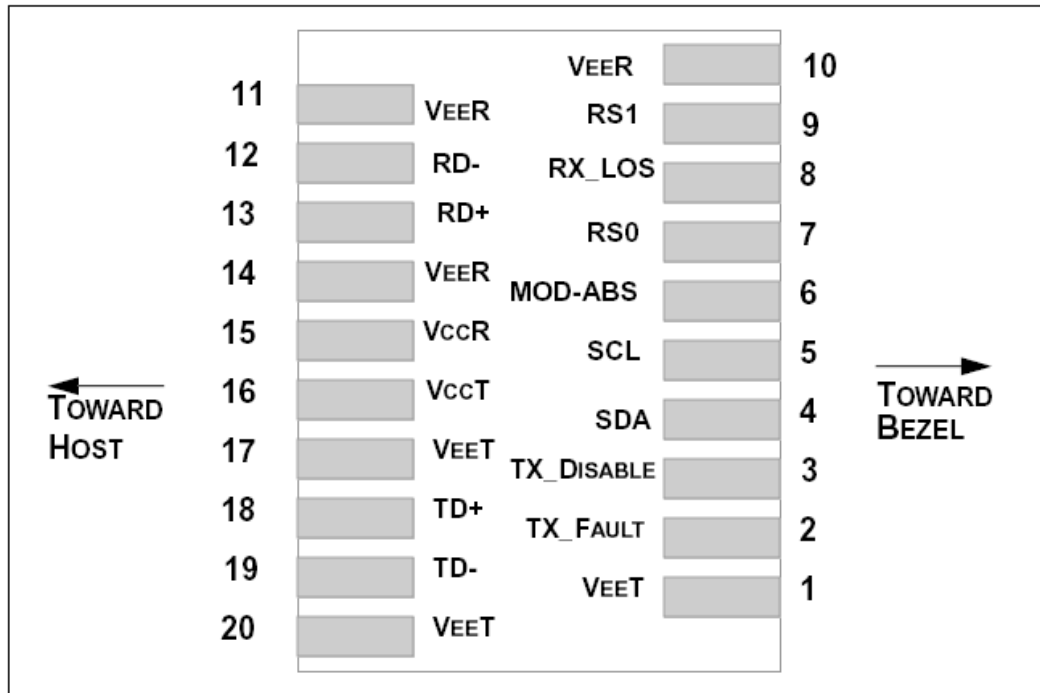


## Package Outline Drawing



Dimension (unit: mm)

**SFP Transceiver Electrical Pad Layout**



## Pinout Table

Pin	Symbol	Name/Description	Ref.	Notes
1	V <sub>EET</sub>	Transmitter Ground	1	5
2	T <sub>FAULT</sub>	Transmitter Fault.	3	1
3	T <sub>DIS</sub>	Transmitter Disable. Laser output disabled on high or open.	3	2
4	SDA	Module Definition 2. Data line for Serial ID.	3	
5	SCL	Module Definition 1. Clock line for Serial ID.	3	
6	MOD-ABS	Module Definition 0. Grounded within the module.	3	3
7	RS0	Rate Select (LVTTTL). No connection required	3	
8	LOS	Loss of Signal indication	3	4
9	RS1	TX Rate Select (LVTTTL).	1	
10	V <sub>EER</sub>	Receiver Ground	1	5
11	V <sub>EER</sub>	Receiver Ground	1	5
12	RD-	Receiver Inverted DATA out. AC Coupled	3	6
13	RD+	Receiver Non-inverted DATA out. AC Coupled	3	7
14	V <sub>EER</sub>	Receiver Ground	1	5
15	V <sub>CCR</sub>	Receiver Power Supply. 3.3V ± 5%	2	7
16	V <sub>CCT</sub>	Transmitter Power Supply. 3.3V ± 5%	2	7
17	V <sub>EET</sub>	Transmitter Ground	1	5
18	TD+	Transmitter Non-Inverted DATA in.	3	8
19	TD-	Transmitter Inverted DATA in.	3	8
20	V <sub>EET</sub>	Transmitter Ground	1	5

### Notes:

- TX Fault is an open collector/drain output, which should be pulled up with a 4.7K – 10KΩ resistor on the host board. Pull up voltage between 2.0V and V<sub>ccT/R</sub>+0.3V. When high, output indicates a laser fault of some kind. Low indicates normal operation. In the low state, the output will be pulled to < 0.8V.
- TX disable is an input that is used to shut down the transmitter optical output. It is pulled up within the module with a 4.7K – 10 KΩ resistor. Its states are:
  - Low (0 – 0.8V): Transmitter on
  - (>0.8, < 2.0V): Undefined
  - High (2.0 – 3.465V): Transmitter Disabled
  - Open: Transmitter Disabled
- Module Absent, connected to V<sub>eeT</sub> or V<sub>eeR</sub> in the module.
- LOS (Loss of Signal) is an open collector/drain output, which should be pulled up with a 4.7K – 10KΩ resistor. Pull up voltage between 2.0V and V<sub>ccT/R</sub>+0.3V. When high, this output indicates the received optical power is below the worst-case receiver sensitivity (as defined by the standard in use). Low indicates normal operation. In the low state, the output will be pulled to < 0.8V.
- The module signal ground contacts, V<sub>eeR</sub> and V<sub>eeT</sub>, should be isolated from the module case.
- RD-/+ : These are the differential receiver outputs. They are AC coupled 100Ω differential lines which should be terminated with 100Ω (differential) at the user SERDES. The AC coupling is done inside the module and is thus not required on the host board.
- V<sub>ccR</sub> and V<sub>ccT</sub> are the receiver and transmitter power supplies. They are defined as 3.3V ±5% at the SFP+ connector pin. Maximum supply current is 300Ma. Inductors with DC resistance of less than 1 ohm should be used in order to maintain the required voltage at the SFP+ input pin with 3.3V supply voltage. When the recommended supply-filtering network is used, hot plugging of the SFP+ transceiver module will result in an inrush current of no more than 30Ma greater than the steady state value. V<sub>ccR</sub> and V<sub>ccT</sub> may be internally connected within the SFP+ transceiver module.
- TD-/+ : These are the differential transmitter inputs. They are AC-coupled, differential lines with 100Ω differential termination inside the module. The AC coupling is done inside the module and is thus not required on the host board.