



## **TECHNICAL SPECIFICATIONS**

### **1310 nm Single-mode 1.25Gbps SFP Transceiver Module**

#### **SFP-GF1310N10**

#### **Revision Record**

Document No.	Date of Issue	Description	Incorporated by	Checked by
SFP-GF1310N10	08/08/2006	Initial Issue	R.T.	E.C.

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## Description

- SFP-GF1310N10 is a hot-pluggable integrated transceiver module with duplex data link through single-mode optical fibers. The transceiver module is in compliant with the MSA Small Form Factor Pluggable (SFP) specifications. It can support data rates up to 1.25Gbps that is suitable for both Gigabit Ethernet and Fiber Channel applications. Model with optional built-in digital diagnostic monitoring interface functions complies to SFF-8472 MSA SFP specifications

## Features

- 1310nm FP or DFP laser transmitter
- Data rates up to 1.25Gbps
- Link length of 10km or 20km with FP laser and 40km with DFB laser
- Duplex LC connector interface
- Hot-pluggable
- Low EMI
- 100Ω differential AC coupled CML outputs
- Single +3.3V power supply and TTL logic interface
- EEPROM with serial ID functions
- Optional digital diagnostic monitoring interface (DDMI) functions
- Compliant to MSA SFP specifications
- RoHS compliant version available
- Operating temperature 0 °C to 70 °C. -40 °C to 85 °C industrial version available

## Applications

- Switch-to-switch interface
- Gigabit Ethernet
- Fiber Channel
- High speed file server interface

## Technical Specifications

### 1. Absolute maximum ratings

Parameter	Symbol	Ratings	Unit
Storage temperature	Tstg	-40~+85	°C
Ambient operating temperature	Top	0~+70	°C
Supply voltage	Vcc	-0.5~4.0	V

### 2. Recommended operating conditions

Parameter	Symbol	Min.	Typ.	Max.	Unit
Ambient operating temperature*	Top	0	—	70	°C
Supply voltage	Vcc	3.15	3.3	3.45	V
Baud rate		1.0625	—	1.25	GBaud
Total supply current	Is	—	—	300	mA
Surge current	Isurge	—	—	30	mA

\* -40 °C to 85 °C industrial version available

### 3. Transmitter characteristics (Tc=0~+70 °C, Vcc=+3.15~+3.6V)

Parameter	Symbol	Condition	Min.	Typ.	Max.	Unit	
Optical center wavelength	$\lambda$		1290	1310	1330	nm	
Spectral width	10km	$\Delta\lambda$	RMS:10km and 20km -20dB: 40km	—	—	3.5	nm
	20km			—	—	3.5	
	40km			—	—	1	
Optical output power	10km	Po	Average@1310nm	-9	—	-3	dBm
	20km			-5.5	—	-3	
	40km			-2	—	3	
Extinction ratio	ER	P1/P0	9	—	—	dB	
Total jitter	TJ	Measured with 2 <sup>7</sup> -1 PRBS@1.25G	—	—	0.43	UI	
Output rise/fall time	tr,tf	20-80%; measured unfiltered	—	—	260	ps	
CML/PECL inputs (Differential)	Vin,pp	AC coupled inputs	400	—	2500	mV	
Input impedance (Differential)	Zin	Rin > 100 k $\Omega$ @DC	85	100	115	$\Omega$	
Tx_DISABLE input Voltage-High			2	—	3.45	V	
Tx_DISABLE input Voltage-Low			0	—	0.8	V	
Tx_FAULT output Voltage--High		Io=400 $\mu$ A, Host Vcc	Vcc-0.5	—	Vcc+0.3	V	
Tx_FAULT output Voltage--Low		Io=-4.0mA	0	—	0.5	V	

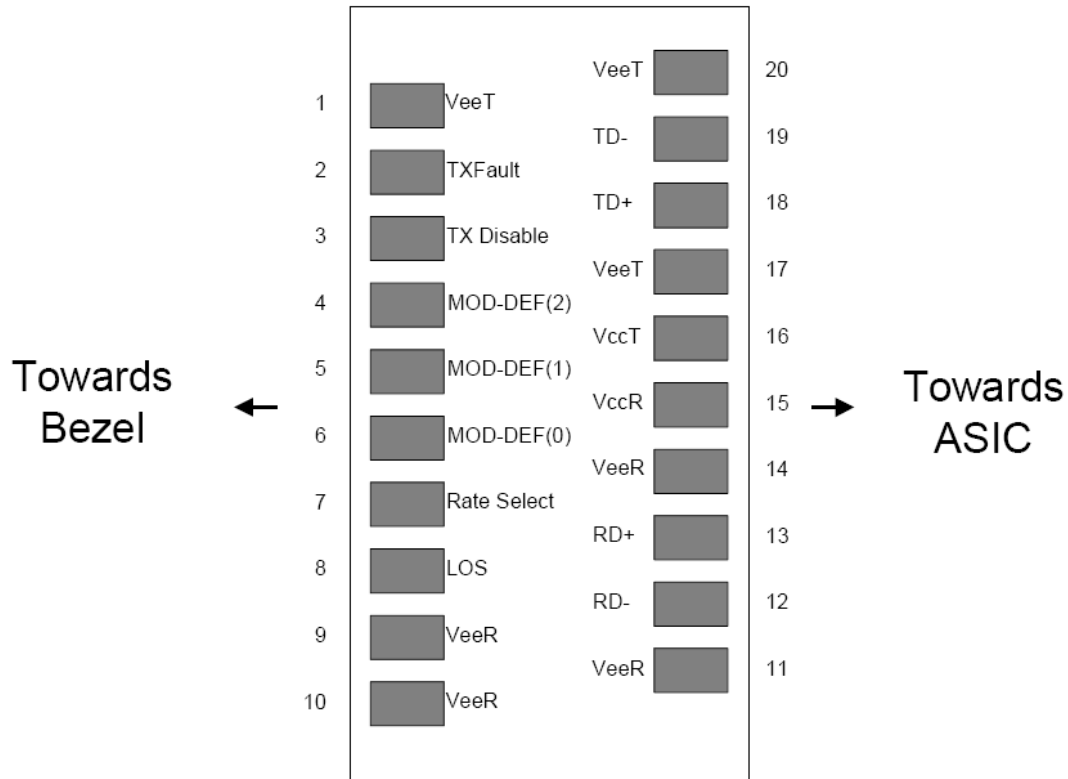
### 4. Receiver characteristics (Tc=0~+70 °C, Vcc=+3.15~+3.6V)

Parameter	Symbol	Condition	Min.	Typ.	Max.	Unit	
Optical input wavelength	$\lambda$		1100	1310	1650	nm	
Sensitivity	10km	Sen	BER<1.0E-12 @ 1.25/1.60258 GBaud	—	—	-22	dBm
	20km			—	—	-22	
	40km			—	—	-24	
Optical return loss	ORL		12	—	—	dB	
Rx_LOS-Asserted	Pa	Measured on transition low to high	-35	—	—	dBm	
Rx_LOS-De-asserted	Pd	Measured on transition high to low	—	—	-24	dBm	
CML outputs (Differential)	Vout,pp	AC coupled outputs	400	800	1200	mV	
Output impedance (differential)	Zout		85	100	115	$\Omega$	
Rx_LOS output Voltage-High		Io=400 $\mu$ A, Host Vcc	Vcc-0.5	—	Vcc+0.3	V	
Rx_LOS output Voltage-Low		Io=-4.0mA	0	—	0.8	V	
Total jitter	TJ	Measured with 2 <sup>7</sup> -1 PRBS@1.25G			0.43	UI	
MOD_DEF 0,1, 2	VoH	With Serial ID	2.5	—	—	V	
	VoL		0	—	0.5		

## 5. General specifications (Tc=0~+70 °C, Vcc=+3.15~+3.6V)

Parameter	Symbol	Condition	Min.	Typ.	Max.	Unit
Link length on 9µm core SMF		BER<1.0E-12	—	—	10	km
		@ 1.25/1.60258	—	—	20	
		GBaud	—	—	40	

## 6. SFP transceiver pin layout



## 7. Pin Descriptions

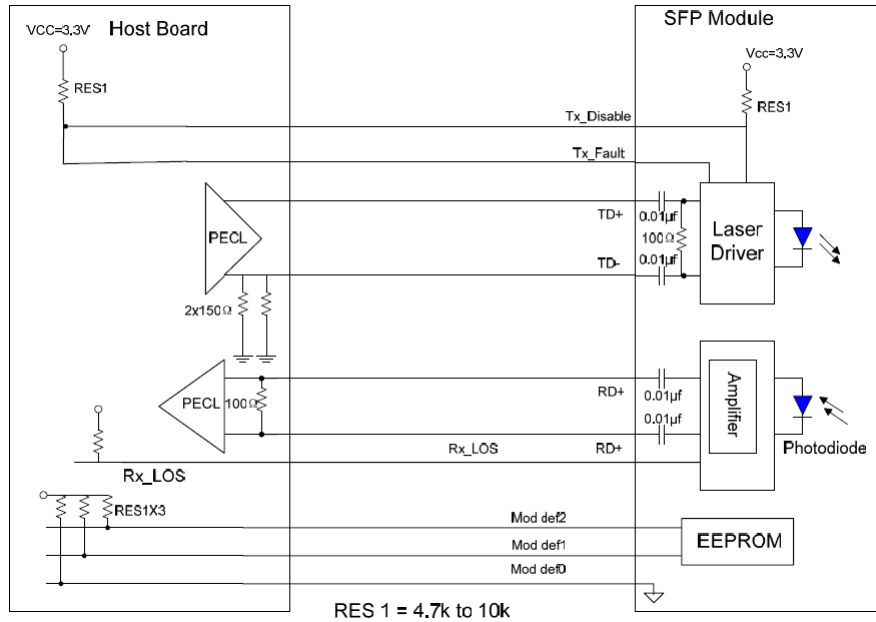
Pin No.	Symbol	Descriptions	Note
1	VeeT	Transmitter ground	
2	TX Fault	Transmitter fault indication	1
3	TX Disable	Transmitter disable, Module disables on high or open	2
4	MOD-DEF2	Module definition 2 - Two wires serial ID interface	3
5	MOD-DEF1	Module definition 1 - Two wires serial ID interface	3
6	MOD-DEF0	Module definition 0 - Two wires serial ID interface	3
7	Rate Select	Not connected	Function not available
8	LOS	Loss of signal	4
9	VeeR	Receiver ground	5
10	VeeR	Receiver ground	5
11	VeeR	Receiver ground	5
12	RD-	Inverted receiver data out	6
13	RD+	Receiver data out	6
14	VeeR	Receiver ground	5
15	VccR	Receiver power, 3.3±5%	7

16	VccT	Transmitter power, 3.3 ±5%	7
17	VeeT	Transmitter ground	5
18	TD+	Transmitter data in	8
19	TD-	Inverted transmitter data in	8
20	VeeT	Transmitter ground	5

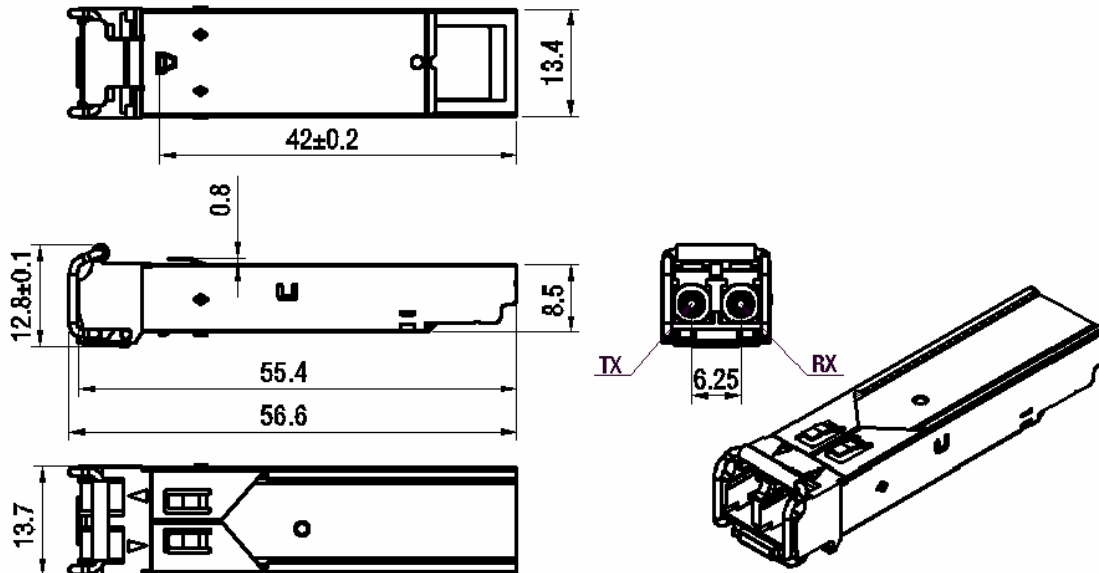
Notes:

1. 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 VccT, R+0.3V. When high, output indicates some kind of laser fault. Low indicates normal operation. In the low state, the output will be pulled to < 0.8V.
2. 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-10KΩ resistor. Its states are:  
Low (0-0.8V): Transmitter on  
(>0.8V, <2.0V): Undefined  
High (2.0-3.465V): Transmitter disabled  
Open: Transmitter disabled
3. MOD-DEF 0,1,2. These are the module definition pins. They should be pulled up with a 4.7K-10KΩ resistor on the host board. The pull-up voltage shall be VccT or VccR. MOD-DEF 0 is grounded by the module to indicate that the module is present, MOD-DEF 1 is the clock line of two wires serial interface for serial ID, and MOD-DEF 2 is the data line of two wires serial interface for serial ID.
4. LOS is an open collector/drain output, which should be pulled up with a 4.7K-10KΩ resistor. Pull up voltage between 2.0V and VccT, R+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.
5. VeeR and VeeT may be internally connected within the SFP module.
6. 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. The voltage swing on these lines will be between 370 and 200mV differential (185-1000mV single-ended) when properly terminated.
7. VccR and VccT are the receiver and transmitter power supplies. They are defined as 3.3V ±5% at the SFP connector pin. Maximum supply current is 300mA. Recommended host board power supply filtering is shown below. Inductors with DC resistance of less than 1Ω 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. VccR and VccT may be internally connected within the SFP transceiver module.
8. 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. The input will accept differential swings of 500-2400mV (250-1250 single-ended), though it is recommended that values between 500 and 1200mV differential (250-600mV single-ended) be used for best EMI performance.

## 8. Recommend circuit schematic



## 9. Mechanical specifications (Unit: mm)



## 10. Notes on digital diagnostic monitoring interface (DDMI)

The SFP-GV0850NX5 SFP transceiver module supports the two-wire serial communication protocol as defined in the SFP Multi-source Agreement (MSA). The optional digital diagnostic monitoring interface (DDMI) of the module provides real-time access to device operating parameters such as transceiver temperature, laser bias current, transmitted optical power, received optical power, and transceiver supply voltage. It also defines a system of alarm flags, which alerts end-users when particular operating parameters are outside of a factory set normal range. Model with the optional DDMI is fully compliant o the SFF-8472 Rev. 9.3 specifications.

The SFP-GV0850NX5 SFP transceiver module defines a 256-byte memory map in EEPROM that is accessible over a two-wire serial interface at the 8-bit address 1010000X (A0h). The DDMI uses the 8-bit address 1010001X (A2h), so the originally defined serial ID memory map remains unchanged. The interface is identical to and is thus fully backward-compatible with the SFP MSA.

The SFP-GV0850NX5 SFP transceiver module with DDMI are externally calibrated (bit 4 is set at address92) which means that the measurements are raw A/D values and must be converted to real world units using calibration constants stored in the EEPROM location 56-95 at two-wire serial bus address A2h.

For detailed interface information, please refer to SFF-8472 rev. 9.3 specifications.

**11. Ordering information:**

**SFP—G F 1310 N 10**

**Data Rate**

- 1.....155Mbps
- 6.....622Mbps
- G.....1.25Gbps
- 2.....2.5Gbps
- 4.....4Gbps

**Laser Type**

- V .....VCSEL
- F .....FP laser
- D .....DFB laser
- X .....Others

**Center Wavelength**

- 0850..... 850nm
- 1310..... 1310nm
- 1550..... 1550nm

**DDMI Type**

- N .....No DDMI
- D .....With DDMI

**Transmission Distance**

- X2 .....200 meters
- X5 .....500 meters
- 10.....10 km
- 40.....40 km
- 80.....80 km
- X .....Others