
1.25Gb/s 850nm 550M PIN SFP Optical Transceiver

GTR1SP1-LS**Features**

- Hot Pluggable SFP MSA package
- SFF-8472 and IEEE 802.3z compliant
- Telcordia GR-468-COREcompliant
- Up to 550m for 50/125 μ m MMF
- Multi rate 1.0625Gb/s~1.25Gb/s
- 850nm VCSEL and PIN receiver
- SFI high speed electrical interface
- 2-wire serial interface with Digital Diagnostic
- +3.3V power supply
- Power consumption less than 1W
- Operating case temperature: -5 to +70 $^{\circ}$ C
- Duplex LC Receptacle
- ROHS-6 compliant

**Applications**

- 1000MBase-SX Ethernet
- 1.06G Fiber Channel, etc

Description

GWORLD Opto's GTR1SP1-LS 1.25G 850nm VCSEL transceivers are designed for use in 1000MBase-SX Ethernet links and 1.06G Fiber Channel, etc, and it can support multi-rate from 1.0625Gb/s~1.25Gb/s. Digital diagnostics are available via 2-wire serial interface as specified in the SFF-8472.

The transceiver's designs are optimized for high performance and cost efficiency to provide customers the best solutions for Datacom and Telecom applications.

The transceiver is RoHS-6 compliant and lead-free per Directive 2002/95/EC.

Product Selection

GTR1SP1-LS

G: GWorld
TR: Transceiver
SP1: SFP 1.25G
LS: 550m

1 1.25Gb/s SFP electrical parameters

1.1 Absolute Maximum Ratings

The limit of the maximum value is shown as below Table 1. (If operating out the limit of the maximum value will cause permanent damage).

Table 1 1.25Gb/s SFP module limit the maximum value

Parameter	Symbol	Conditions	Min.	Max	Unit
Storage temperature (case)	T _{stg}	—	-40	+85	°C
Operating case temperature	T _{op}	—	-5	+70	°C
Relative humidity	RH	0	—	95	%
Damage Threshold for Receiver	P _{max}	—	—	+2.0	dBm
Power Supply	V _{cc} 3.3V	—	-0.5	+3.6	V
ESD Sensitivity on module and all host pins	HBM	Human Body model R=1.5K, C=100pF	—	2000	V

1.2 Recommended operating conditions

The recommended working conditions are shown as below Table 2.

Table 2 1.25Gb/s SFP recommended working conditions

Parameter	Symbol	Min.	Typ.	Max.	Unit
Operating Case Temperature	T _c	-5		+70	°C
Supply voltage	V _{cc} 3.3V	+3.15	+3.3	+3.45	V
Supply Current	I _{cc} 3.3V	—	—	280	mA
Power dissipation	P	—	—	1.0	W
Link Distance	L	2m	—	550m	MMF

2 1.25Gb/s SFP Specifications

2.1 Optical Specifications

Table 3 1.25Gb/s SFP Optical Specifications (transmission distance 40km)

Parameter	Symbol	Condition	Min.	Typ.	Max.	Unit
Transmitter						
Center Wavelength	λ _c		840	850	860	nm
Signal speed(nominal)	f _D		1.0625	1.25	—	Gbps
Average Optical Output Power	P _{out}		-9	—	-3	dBm
Average launch power of OFF transmitter	P _{out-off}		—	—	-30	dBm
Optical Eye Mask		1.25Gb/s	IEEE 802.3z and ANSI Fibre Channel Compliant			
Extinction Ratio	E _R		9	—	—	dB
Spectral Width (RMS)	σ λ				0.65	nm

Rise/Fall Time	Tr/Tf	(20%~80%)			0.26	ns
Receiver						
Center Wavelength Range	λ_c		770	850	860	nm
Average Receiver Sensitivity	Psen		—	—	-17	dBm
Receiver Overload	Pov		0	—	—	dBm
LOS Assert	LOSass		-30	—	—	dBm
LOS Deassert	LOSde-ass		—	—	-17	dBm
LOS Hysteresis			0.5	1.5	4	dB

Note1. Measured with PRBS 2^7-1 @ 1.25Gb/s

2.2 Electrical specifications

Table 4 1.25Gb/s SFP Electrical Interface Specifications

Parameter	Symbol	Condition	Min.	Typ.	Max.	Unit
Transmitter						
Differential Data Input Amplitude ¹	Vin-diff		300	—	1600	mVpp
Input Differential Impedance	Zdiff		—	100	—	ohm
Tx_Fault ²	L	V _{OL}	0	—	0.5	V
	H	V _{OH}	2.0	—	Vcc+0.3	V
Tx_Disable	L	V _{IL}	0	—	0.8	V
	H	V _{IH}	2.0	—	Vcc+0.3	V
Receiver						
Differential Data Output amplitude ³	Vout-diff		400	—	1000	mVpp
Output Differential Impedance	Zdiff		—	100	—	ohm
Rx_LOS ²	L	V _{OL}	0	—	0.8	V
	H	V _{OH}	2.0	—	Vcc+0.3	V

Note1: TD+/- are internally AC coupled with 100 Ω differential termination inside the module

Note2: Tx Fault and Rx LOS are open collector outputs, which should be pulled up with 4.7k to 10k resistors on the host board. Pull up voltage between 2.0V and Vcc+0.3V.

Note3: RD+/- outputs are internally AC coupled, and should be terminated with 100 Ω (differential) at the user SERDES.

3 1.25Gb/s SFP Function Diagram

3.1 Internal reference structure

The internal structure of 1.25Gb/s SFP shown as Figure 1.

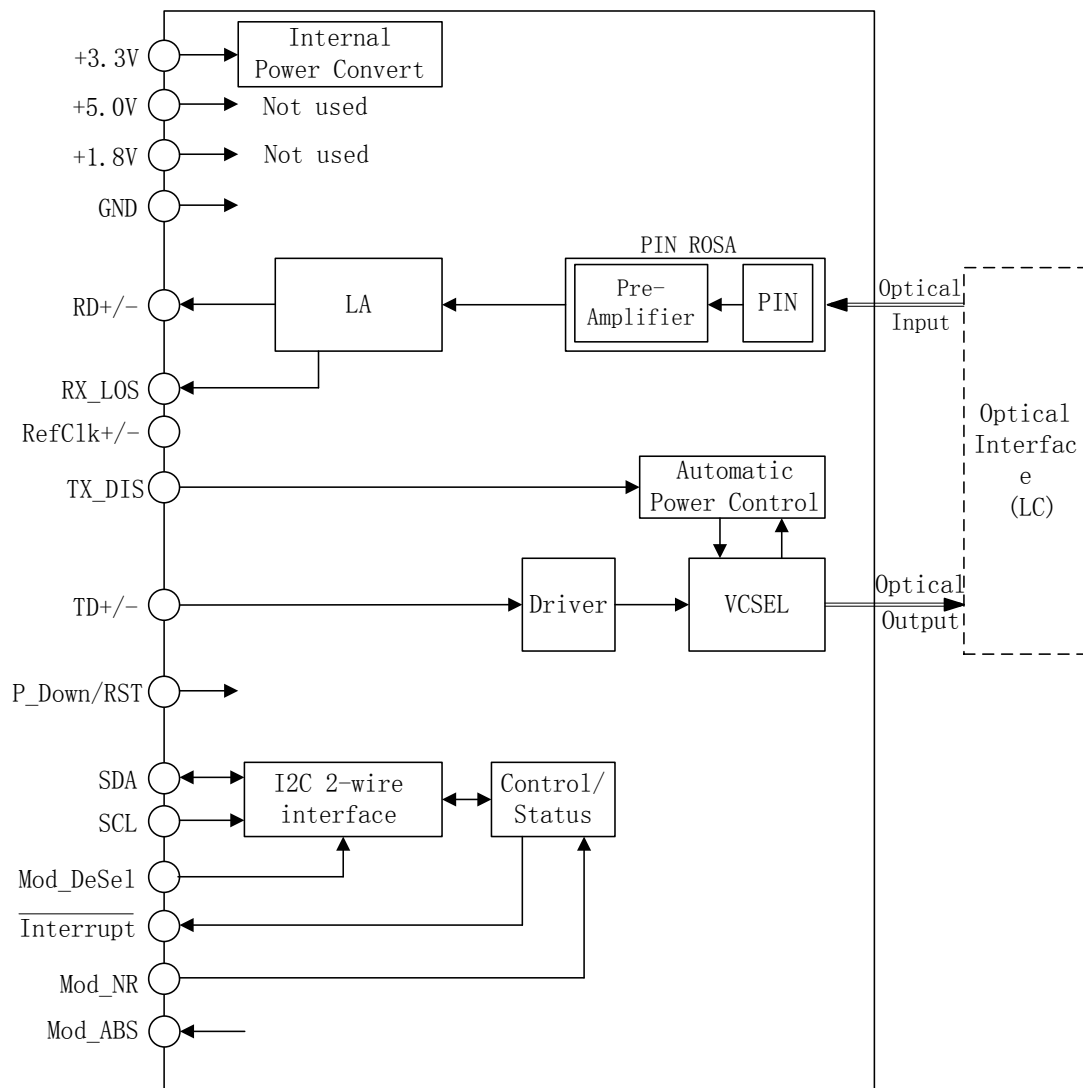


Figure 1. 850nm 550M 1.25Gb/s SFP internal structure

3.2 Recommended Interface Circuit

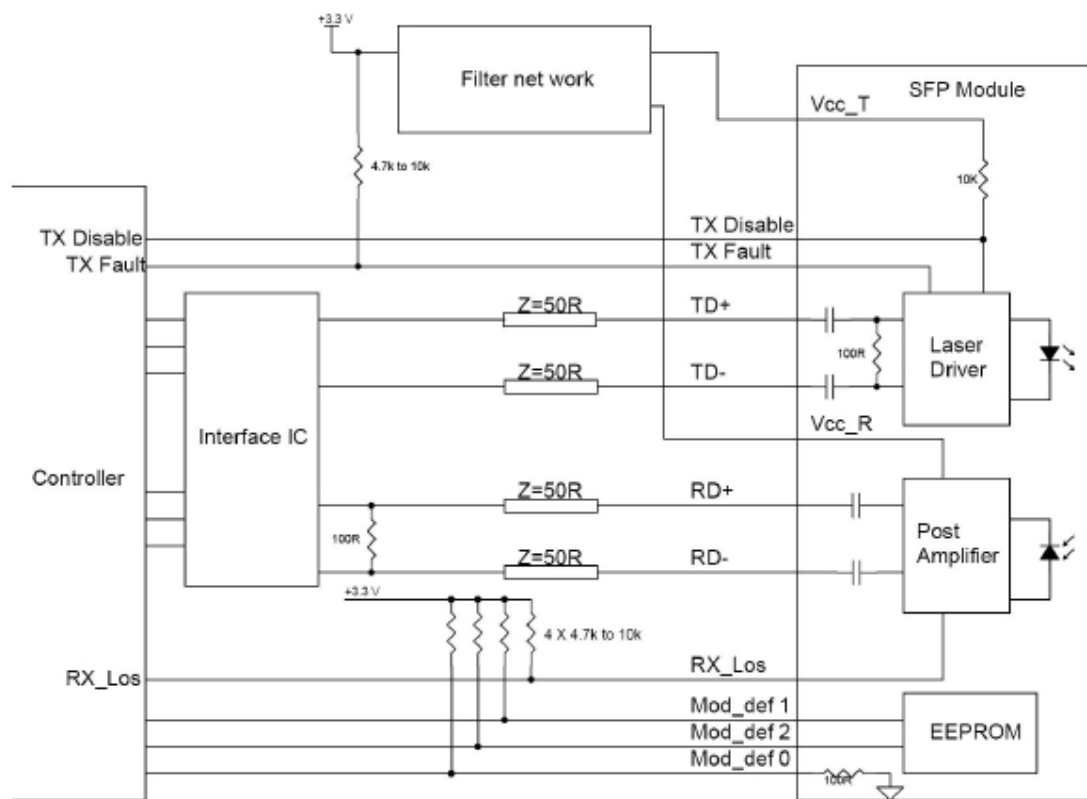


Figure 2. Recommended Interface Circuit

3.3 Pin layout

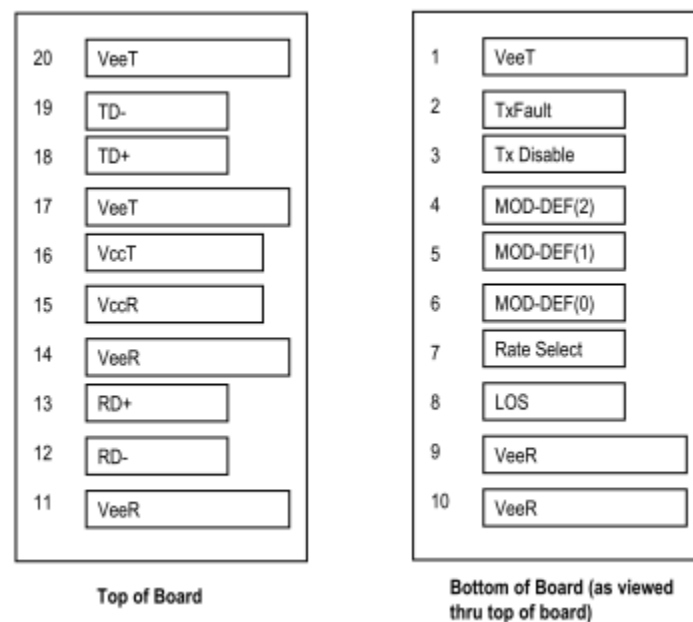


Figure 3. SFP Transceiver Electrical Pad Layout

3.4 Pin definition

Table 5 1.25Gb/s SFP Pin Definition

PIN	Name	Description
1	V _{EE} T	Module Transmitter Ground
2	TX_FAULT	Tx fault indication, Open Collector Output, active "H" ¹
3	TX_DISABLE	LVTTTL Input, internal pull-up, Tx disabled on "H" ²
4	MOD-DEF2	2 wire serial interface data input/output (SDA) ³
5	MOD-DEF1	2 wire serial interface clock input (SCL) ³
6	MOD-DEF0	Model present indication ³
7	Rate select	No connection
8	LOS	Rx loss of signal, Open Collector Output, active "H" ⁴
9	VeeR	Module Rx ground
10	VeeR	Module Rx ground
11	VeeR	Module Rx ground
12	RD-	Inverse received data out ⁵
13	RD+	Received data out ⁵
14	VeeR	Module Rx ground
15	VccR	Rx power supply
16	VccT	Tx power supply
17	VeeT	Tx ground
18	TD+	Transmit data in ⁶
19	TD-	Inverse transmit data in ⁶
20	VeeT	Tx ground

Note1: When high, this output indicates a laser fault of some kind. Low indicates normal operation. And should be pulled up with a 4.7 – 10KΩ resistor on the host board.

Note2: TX disable is an input that is used to shut down the transmitter optical output. It is pulled up within the module with a 4.7 – 10KΩ 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

Note3: 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 (see Section IV for further details).

Mod-Def 0 is grounded by the module to indicate that the module is present

Mod-Def 1 is the clock line of two wire serial interface for serial ID

Mod-Def 2 is the data line of two wire serial interface for serial ID

Note4: When high, this output indicates loss of signal (LOS). Low indicates normal

operation.

Note5: RD+/-: These are the differential receiver outputs. They are AC coupled 100 Ω differential lines which should be terminated with 100 Ω (differential) at the user SERDES. The AC coupling is done inside the module and is thus not required on the host board.

Note6: TD+/-: These are the differential transmitter inputs. They are AC-coupled, differential lines with 100 Ω differential termination inside the module. The AC coupling is done inside the module and is thus not required on the host board.

The host board power supply should be well filtered shown in Figure 4, to meet the noise filtering requirements in most system and achieve SFP module specifications performance.

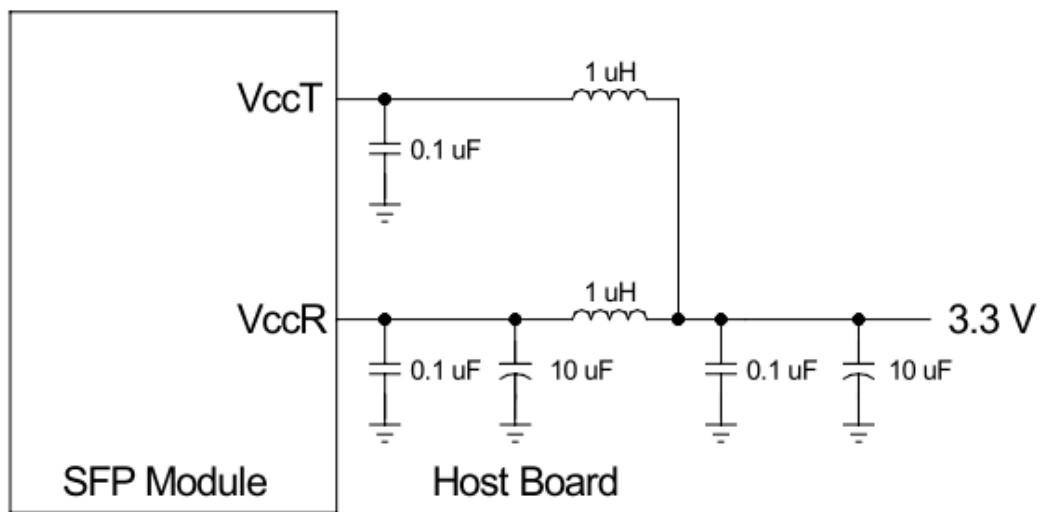


Figure 4. Example of Host Board Supply Filtering Network

4 1.25Gb/s SFP Mechanical Specifications

1.25Gb/s SFP mechanical dimensions should be compliant with SFF-8432. Detailed dimensions are shown in Figure 5.



Figure 6 Mechanical Dimensions of Electrical Connectors on SFP module PCB

Table 6 Fiber Connector Type

8 / 12

Connector	Straight LC/PC	
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5 Management Interface

GWORLD GTR1SP1-LS SFP transceivers support the 2-wire serial communication protocol as defined in the SFP MSA .

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 8. Detailed ID information(A0h) is listed in Table 9. And the DDM specification(A2h) is described in Table 10. For more details of the memory map and byte definitions, please refer to the SFF-8472 (Rev 9.3, Aug. 2002), "Digital Diagnostic Monitoring Interface for Optical Transceivers".

The DDM parameters have been internally calibrated.

Table 8 Digital Diagnostic Memory Map (Specific Data Field Descriptions)

2 wire address 1010000X (A0h)		2 wire address 1010001X (A2h)	
Address	Information	Address	Information
0~95	Serial ID Defined by SFP MSA (96 bytes)	0~55	Alarm and Warning Thresholds (56 bytes)
		56~95	Calibration Constants (40 bytes)
96~127	Vendor Specific (32 bytes)	96~119	Real Time Diagnostic Interface (24 bytes)
		120~127	Vender Specific (8 bytes)
128~255	Reserved,SFF8079 (128 bytes)	128~247	User Writable EEPROM (120 bytes)
		248~255	Vender Specific (8 bytes)

Table 9 EEPROM Serial ID Memory Contents (A0h)

Data Address	Size (Bytes)	Name of Field	Value(Hex)	Description of Field
BASE ID FIELDS				
0	1	Identifier	03	SFP
1	1	Ext. Identifier	04	MOD4
2	1	Connector	07	LC
3-10	8	Transceiver	0000000212000101	
11	1	Encoding	01	8B10B
12	1	BR, Nominal	0D	1.25Gbps
13	1	Reserved	00	
14	1	Length(9μm,km)	00	
15	1	Length (9μm)	00	
16	1	Length (50μm)	37	550m
17	1	Length (62.5μm)	1E	300m
18	1	Length (Copper)	00	
19	1	Reserved	00	
20-35	16	Vendor name		GWORLD
36	1	Reserved	00	

37-39	3	Vendor OUI	000000	
40-55	16	Vendor PN		GTR1SP1-LS
56-59	4	Vendor rev	31 30 20 20	10
60-61	2	Wavelength	0352	850nm
62	1	Reserved	00	
63	1	CC_BASE	XX	Check code for Base ID Fields
EXTENDED ID FIELDS				
64-65	2	Options	001A	Los, Tx_falt, Tx_diabie
66	1	BR, max	00	Upper bit rate margin, units of %
67	1	BR, min	00	Lower bit rate margin, units of %
68-83	16	Vendor SN	xx xx xx xx xx xx xx xx xx xx xx xx xx xx xx xx	Serial number(ASCII)
84-91	8	Date code	xx xx xx xx xx xx xx xx	Vendor's manufacturing date code (ASCII)
92	1	Diagnostic Monitoring Type	68	Digital diagnostics and internal calibration
93	1	Enhanced Options	80	Alarm/Warning flags implemented
94	1	SFF-8472 Compliance	01	
95	1	CC_EXT	xx	Check code for the Extended ID Fields
VENDOR SPECIFIC ID FIELDS				
96-127	32	Vendor Specific		Vendor Specific EEPROM
128-255	128	Reserved		Reserved for SFF-8079.

Note: The "xx" byte should be filled in according to practical case. For more information, please refer to the related document of SFF- 8472 Rev 9.3

Table 10 DDM Specification

Parameter	Range	Accuracy	Calibration
Temperature	-5 ~ 70 °C	±3°C	Internal
Voltage	3.0 ~ 3.6 V	±3%	Internal
Bias Current	0 ~ 60mA	±10%	Internal
TX Power	-10 ~ -3dBm	±3dBm	Internal
RX Power	-18 ~ 0dBm	±3dBm	Internal

6 Ordering Information

Table 11 Order Information

Part No.	Application	Data Rate	Transmitter	Receiver	Fiber Type	Connector	Note
GTR1SP1-LS-D	1000MBase-L X Ethernet 1.06G FC	1.25Gb/s 1.06Gb/s	VCSEL	PIN	MMF	LC/PC	With DDM
GTR1SP1-LS-N	1000MBase-L X Ethernet 1.06G FC	1.25Gb/s 1.06Gb/s	VCSEL	PIN	MMF	LC/PC	Without DDM

7 Revision History

Rev.	Date	Modification	Note
V1.0	Oct 10 th , 2012		New

Warnings

Handling Precautions: This device is susceptible to damage as a result of electrostatic discharge (ESD). A static free environment is highly recommended. Follow guidelines according to proper ESD procedures.

Laser Safety: Radiation emitted by laser devices can be dangerous to human eyes. Avoid eye exposure to direct or indirect radiation.

Contact

China Headquarters

Section C, Floor 2,Building 1,Street 3,Shangdi Information Industry Base, Haidian District,
Beijing, 100085, China
Tel:+86-10-62973240
Fax: +86-10-62968049
Email:Sales@gworldopto.com

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