

1.25Gbps SFP Optical Transceiver, 20km Reach GP-3124- L2x(D)

Features

- ◆ Dual data-rate of 1.25Gbps/1.063Gbps operation
- ◆ 1310nm FP laser and PIN photodetector for 20km transmission
- ◆ Compliant with SFP MSA and SFF-8472 with duplex LC receptacle
- ◆ Digital Diagnostic Monitoring:
Internal Calibration or External

Calibration

- ◆ Compatible with SONET OC-24-LR-1
- ◆ Compatible with RoHS
- ◆ +3.3V single power supply
- ◆ Operating case temperature:
Standard : 0 to +70°C
Industrial : -40 to +85°C



Applications

- ◆ Gigabit Ethernet
- ◆ Fiber Channel
- ◆ Switch to Switch interface
- ◆ Switched backplane applications
- ◆ Router/Server interface
- ◆ Other optical transmission systems

Description

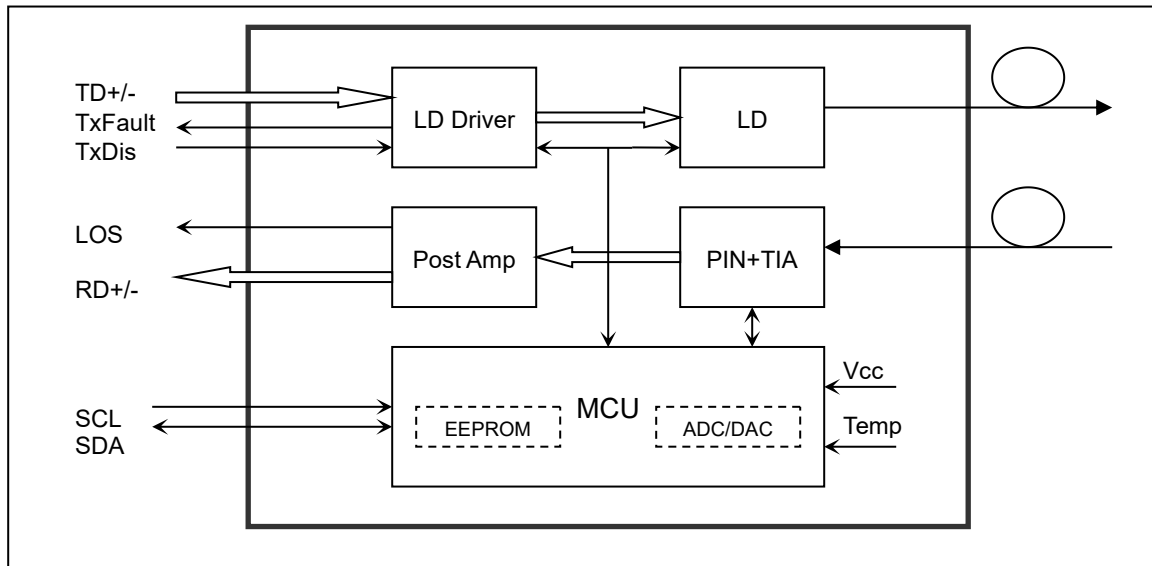
The SFP transceivers are high performance, cost effective modules supporting dual data-rate of 1.25Gbps/1.0625Gbps and 20km transmission distance with SMF.

The transceiver consists of three sections: a FP laser transmitter, a PIN photodiode integrated with a

trans-impedance preamplifier (TIA) and MCU control unit. All modules satisfy class I laser safety requirements.

The transceivers are compatible with SFP Multi-Source Agreement (MSA) and SFF-8472. For further information, please refer to SFP MSA.

Module Block Diagram



Absolute Maximum Ratings

Table 1 - Absolute Maximum Ratings

Parameter	Symbol	Min	Max	Unit
Supply Voltage	Vcc	-0.5	4.5	V
Storage Temperature	Ts	-40	+85	°C
Operating Humidity	-	5	85	%

Recommended Operating Conditions

Table 2 - Recommended Operating Conditions

Parameter	Symbol	Min	Typical	Max	Unit
Operating Temperature	Case	Standard	0	+70	°C
		Industrial	-40	+85	°C
Power Supply Voltage	Vcc	3.13	3.3	3.47	V
Power Supply Current	Icc			300	mA

Data Rate	Gigabit Ethernet			1.25		Gbps
	Fiber Channel			1.063		

Optical and Electrical Characteristics

Table 3 - Optical and Electrical Characteristics

Parameter	Symbol	Min	Typical	Max	Unit	Notes
Transmitter						
Centre Wavelength	λ_c	1260	1310	1360	nm	
Spectral Width (RMS)	σ			4	nm	
Average Output Power	P _{out}	-9		-3	dBm	1
Extinction Ratio	ER	9			dB	
Optical Rise/Fall Time (20%~80%)	t _r /t _f			0.26	ns	
Data Input Swing Differential	V _{IN}	400		1800	mV	2
Input Differential Impedance	Z _{IN}	90	100	110	Ω	
TX Disable	Disable		2.0	V _{cc}	V	
	Enable		0	0.8	V	
TX Fault	Fault		2.0	V _{cc}	V	
	Normal		0	0.8	V	
Receiver						
Centre Wavelength	λ_c	1260		1580	nm	
Receiver Sensitivity				-19	dBm	3
Receiver Overload		-3			dBm	3
LOS De-Assert	LOS _D			-24	dBm	
LOS Assert	LOS _A	-35			dBm	
LOS Hysteresis		1		4	dB	
Data Output Swing Differential	V _{out}	400		1800	mV	4
LOS	High		2.0	V _{cc}	V	
	Low			0.8	V	

Notes:

1. The optical power is launched into SMF.
2. PECL input, internally AC-coupled and terminated.
3. Measured with a PRBS 2⁷-1 test pattern @1250Mbps, BER ≤ 1×10⁻¹².
4. Internally AC-coupled.

Timing and Electrical
Table 4 - Timing and Electrical

Parameter	Symbol	Min	Typical	Max	Unit
Tx Disable Negate Time	t_on			1	ms
Tx Disable Assert Time	t_off			10	μs
Time To Initialize, including Reset of Tx Fault	t_init			300	ms
Tx Fault Assert Time	t_fault			100	μs
Tx Disable To Reset	t_reset	10			μs
LOS Assert Time	t_loss_on			100	μs
LOS De-assert Time	t_loss_off			100	μs
Serial ID Clock Rate	f_serial_clock			400	KHz
MOD_DEF (0:2)-High	V _H	2		V _{cc}	V
MOD_DEF (0:2)-Low	V _L			0.8	V

Diagnostics
Table 5 – Diagnostics Specification

Parameter	Range	Unit	Accuracy	Calibration
Temperature	0 to +70	°C	±3°C	Internal / External
	-40 to +85			
Voltage	3.0 to 3.6	V	±3%	Internal / External
Bias Current	0 to 100	mA	±10%	Internal / External

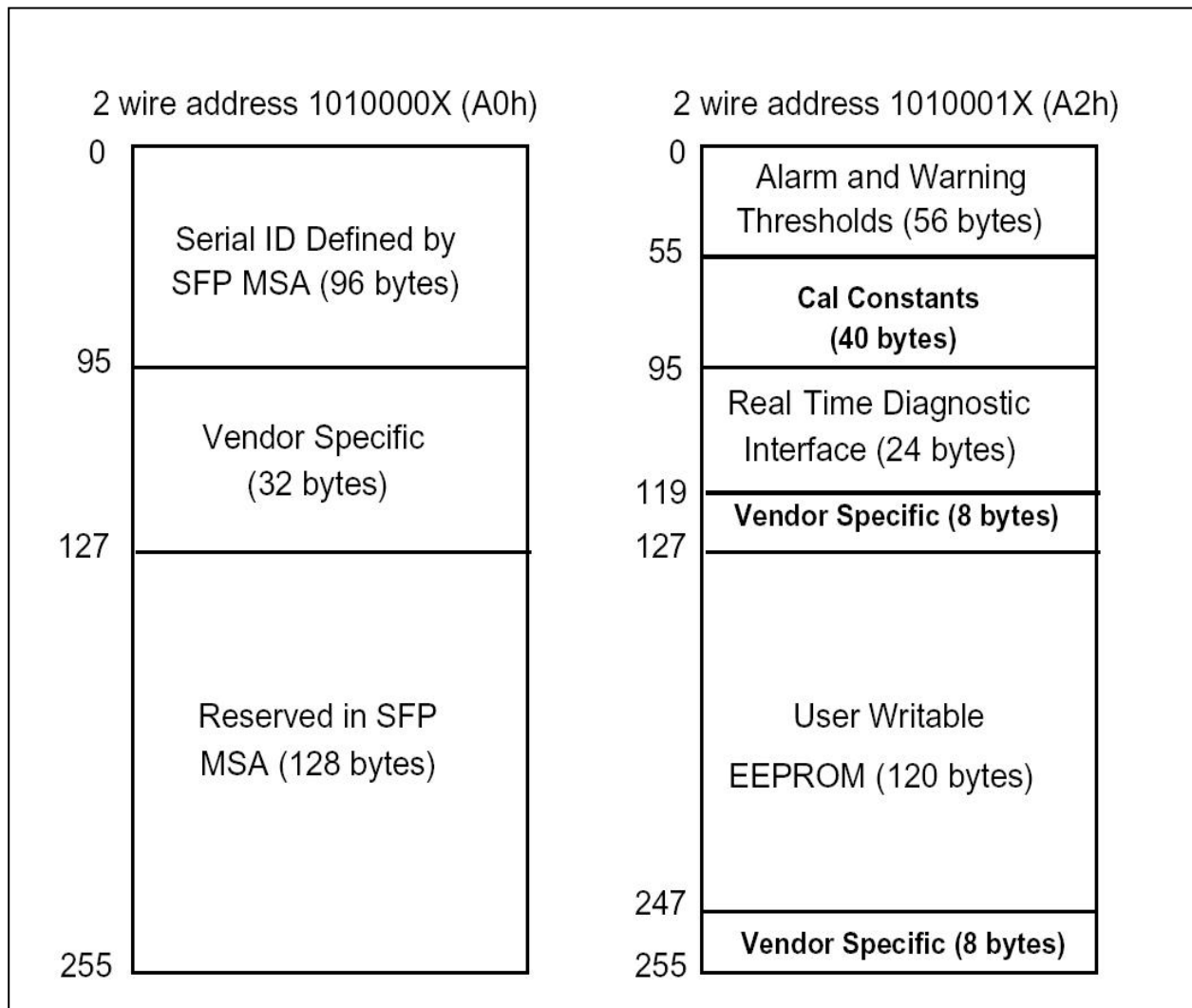
TX Power	-9 to -3	dBm	±3dB	Internal / External
RX Power	-23 to -3	dBm	±3dB	Internal / External

Digital Diagnostic Memory Map

The transceivers provide serial ID memory contents and diagnostic information about the present operating conditions by the 2-wire serial interface (SCL, SDA).

The diagnostic information with internal calibration or external calibration all are implemented, including received power monitoring, transmitted power monitoring, bias current monitoring, supply voltage monitoring and temperature monitoring.

The digital diagnostic memory map specific data field defines as following.



EEPROM Serial ID Memory Contents (A0h)

Data Address	Field Size (Byte)	Name of Field	HEX	Description of Field
0	1	Identifier	03	SFP+
1	1	Ext. Identifier	04	GBIC/SFP function is defined by two-wire interface ID only
2	1	Connector	07	LC
3	8	Infiniband Compliance	00	Not Specified
4	1	Reach Specifier	00	Not Specified
5	1	SONET	00	Unspecified
6	1	Gigabit Ethernet	02	1000BASE-LX
7	1	Fiber Channel Link Length	0A	Medium distance(M),Longwave laser(LC)
8	1	Transmitter technology	00	Unspecified
9	1	Transmission Media	01	Single Mode (SM)
10	1	Fiber Channel Speed	01	100Mbytes/sec
11	1	Encoding	01	GBIC
12	1	BR, Nominal	D	1.25 G
13	1	Rate Identifier	00	Unspecified
14	1	Length(SMF, km)	14	20Km
15	1	Length(SMF)	C8	20Km
16	1	Length (50um)	00	0m
17	1	Length (62.5um)	00	0m
18	1	Length (cable)	00	0 m
19	1	Length (OM3)	00	0 m
20-35	16	Vendor Name	47 69 67 61 6C 69 67 68 74 20 20 20 20 20 20 20	Gigalight
36	1	Transceiver codes	00	Unallocated
37-39	3	Vendor OUI	00 00 00	Unspecified
40-55	16	Vendor PN	47 50 2D 33 31 32 34 2D 4C 32 78 44 20 20 20 20	GP-3124-L2xD
56-59	4	Vendor rev	31 2E 30 20	1.0
60-61	2	Wavelength	05 1E	1310 nm
62	1	Reserved	00	Reserved
63	1	CC BASE	xx	Check Sum Byte for Bytes 0 to 63
64-65	2	Options Values	00 1A	Rx LOS[1], Tx FAULT[3],

Data Address	Field Size (Byte)	Name of Field	HEX	Description of Field
				Tx_DISABLEs[4]
66	1	BR, max	00	Not Specified
67	1	BR, min	00	Not Specified
68-83	16	Vendor SN	53 xx xx xx xx xx xx xx	Sxxxxxxx
84-91	8	Date Code	xx xx xx xx xx xx 20 20	ASCII Year(2Byte), Month (2Byte), Day(2 Byte)
92	1	Diagnostic Monitoring Type	68	Digital diagnostic[6], Internally Calibrate[4], Average Power[3]]
93	1	Enhanced Options	F0	Optional Alarm/warning flags
94	1	SFF-8472 Compliance	01	Includes functionality described in Rev9.3 of SFF-8472
95	1	CC_EXT	xx	Check Sum Byte for Bytes 64 to 94
96-127	32	Vendor Specific EEPROM	Reserved	Vendor Specific
128-255	128	Reserved, SFF8079		Reserved

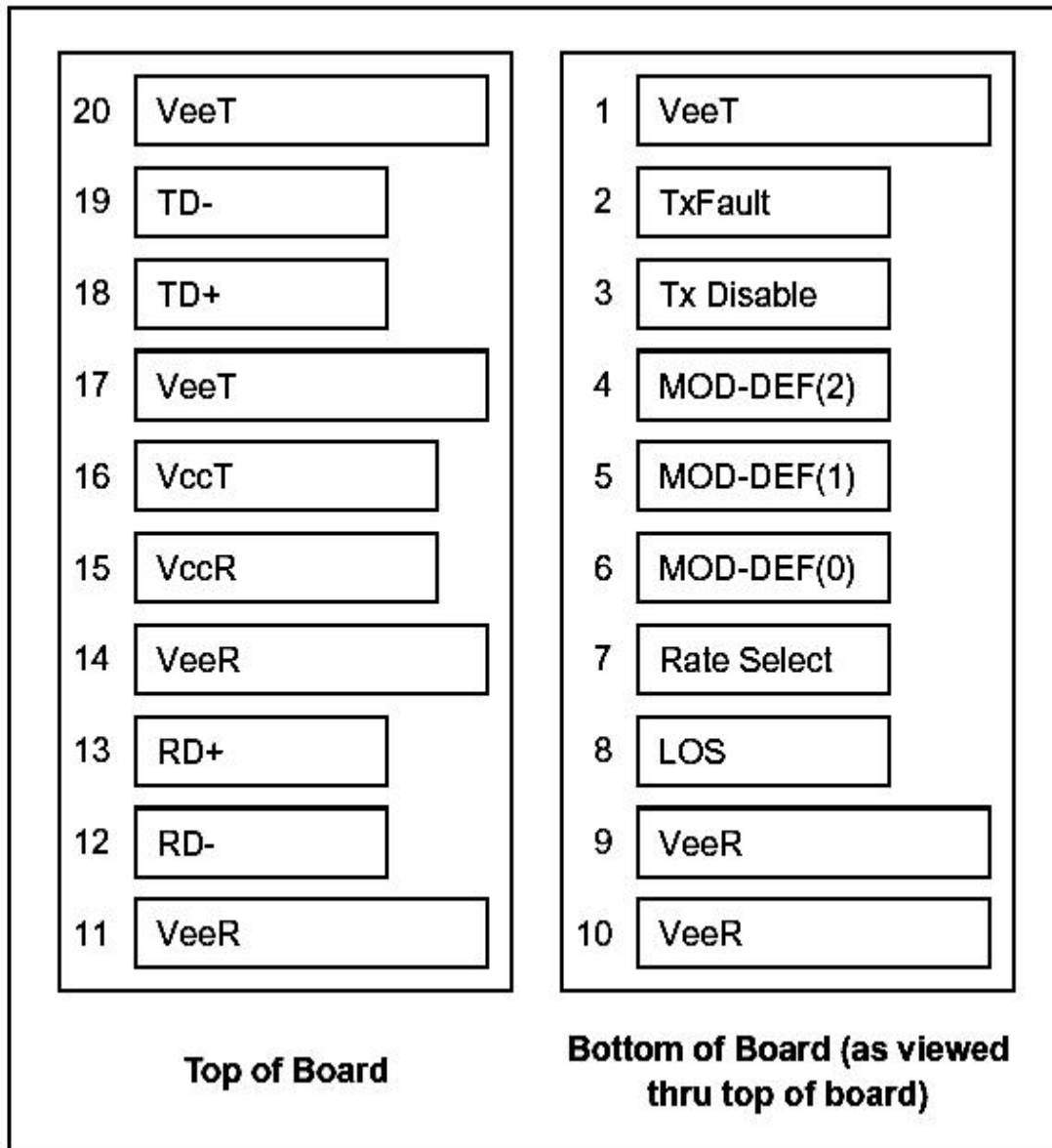
Digital Diagnostic Monitoring Interface (2-Wire Address A2h)

A2 EEPROM Definition					
Data Addr	Field Size (Byte)	Name Of filed	Description of field	Coded value	Hex
0	2	Temp High Alarm	Temp High Alarm	100.00℃	64
1					00
2	2	Temp Low Alarm	Temp Low Alarm	-50.00℃	CE
3					00
4	2	Temp High Warning	Temp High Warning	95.00℃	5F
5					00
6	2	Temp Low Warning	Temp Low Warning	-45.00℃	D3
7					00
8	2	Voltage High Alarm	Voltage High Alarm	3.70V	90
9					88
10	2	Voltage Low Alarm	Voltage Low Alarm	2.90V	71
11					48
12	2	Voltage High Warning	Voltage High Warning	3.60V	8C
13					A0
14	2	Voltage Low Warning	Voltage Low Warning	3.00V	75
15					30

16	2	Bias High Alarm	Bias High Alarm	65.00mA	7E
17					F4
18	2	Bias Low Alarm	Bias Low Alarm	10.00mA	13
19					88
20	2	Bias High Warning	Bias High Warning	60.00mA	75
21					30
22	2	Bias Low Warning	Bias Low Warning	12.00mA	17
23					70
24	2	TX Power High Alarm	TX Power High Alarm	1.00dBm	31
25					2D
26	2	TX Power Low Alarm	TX Power Low Alarm	-13.00dBm	01
27					F5
28	2	TX Power High Warning	RX Power High Alarm	0dBm	27
29					10
30	2		RX Power Low Alarm	-12 dBm	02
31					76

Pin Definitions

Pin Diagram



Pin Descriptions

Pin	Signal Name	Description	Plug Seq.	Notes
1	V _{EET}	Transmitter Ground	1	
2	TX FAULT	Transmitter Fault Indication	3	Note 1
3	TX DISABLE	Transmitter Disable	3	Note 2
4	MOD_DEF(2)	SDA Serial Data Signal	3	Note 3
5	MOD_DEF(1)	SCL Serial Clock Signal	3	Note 3
6	MOD_DEF(0)	TTL Low	3	Note 3
7	Rate Select	Not Connected	3	
8	LOS	Loss of Signal	3	Note 4
9	V _{EER}	Receiver ground	1	
10	V _{EER}	Receiver ground	1	
11	V _{EER}	Receiver ground	1	
12	RD-	Inv. Received Data Out	3	Note 5
13	RD+	Received Data Out	3	Note 5
14	V _{EER}	Receiver ground	1	
15	V _{CCR}	Receiver Power Supply	2	
16	V _{CCT}	Transmitter Power Supply	2	
17	V _{EET}	Transmitter Ground	1	
18	TD+	Transmit Data In	3	Note 6
19	TD-	Inv. Transmit Data In	3	Note 6
20	V _{EET}	Transmitter Ground	1	

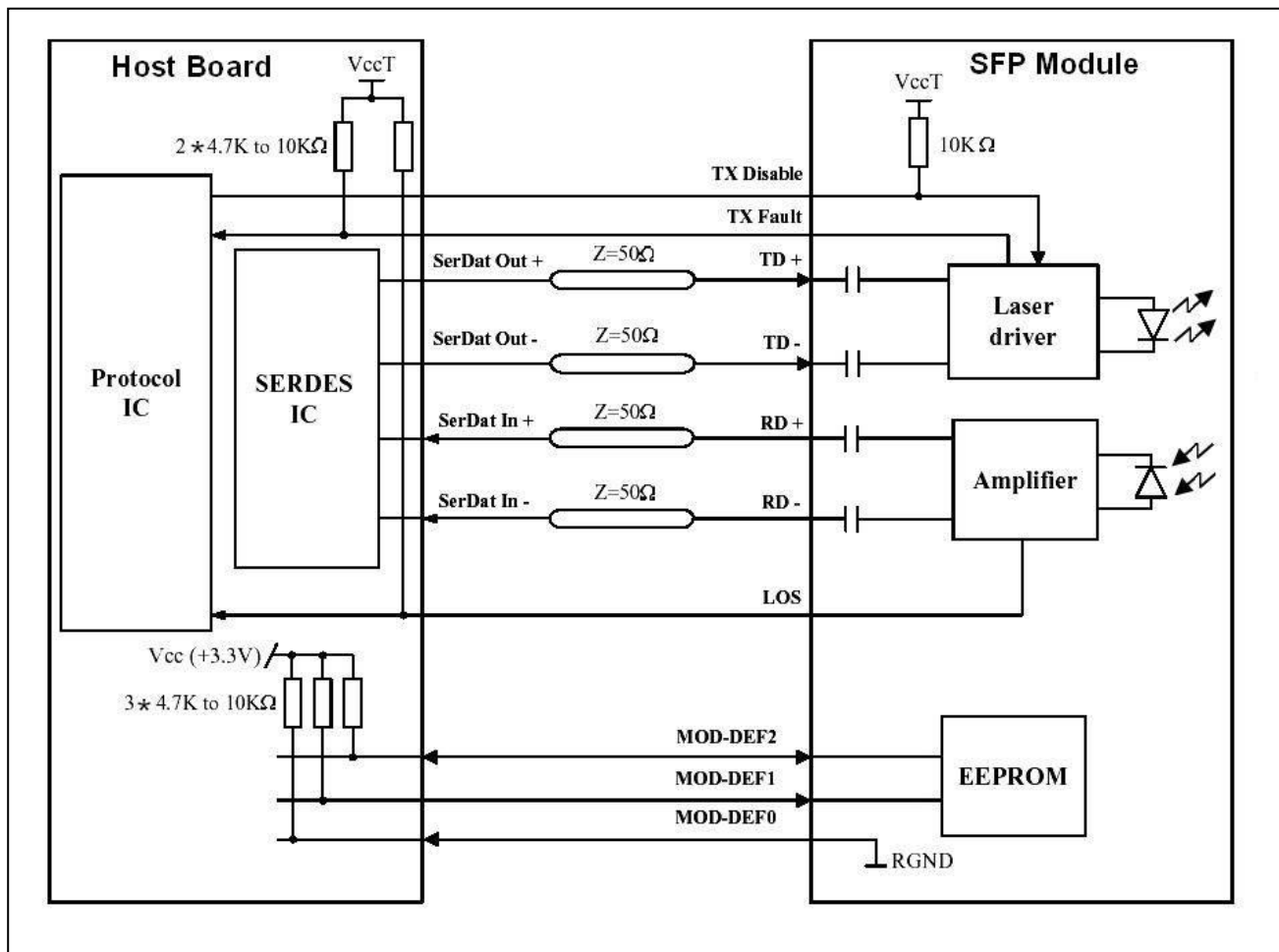
Notes:

Plug Seq.: Pin engagement sequence during hot plugging.

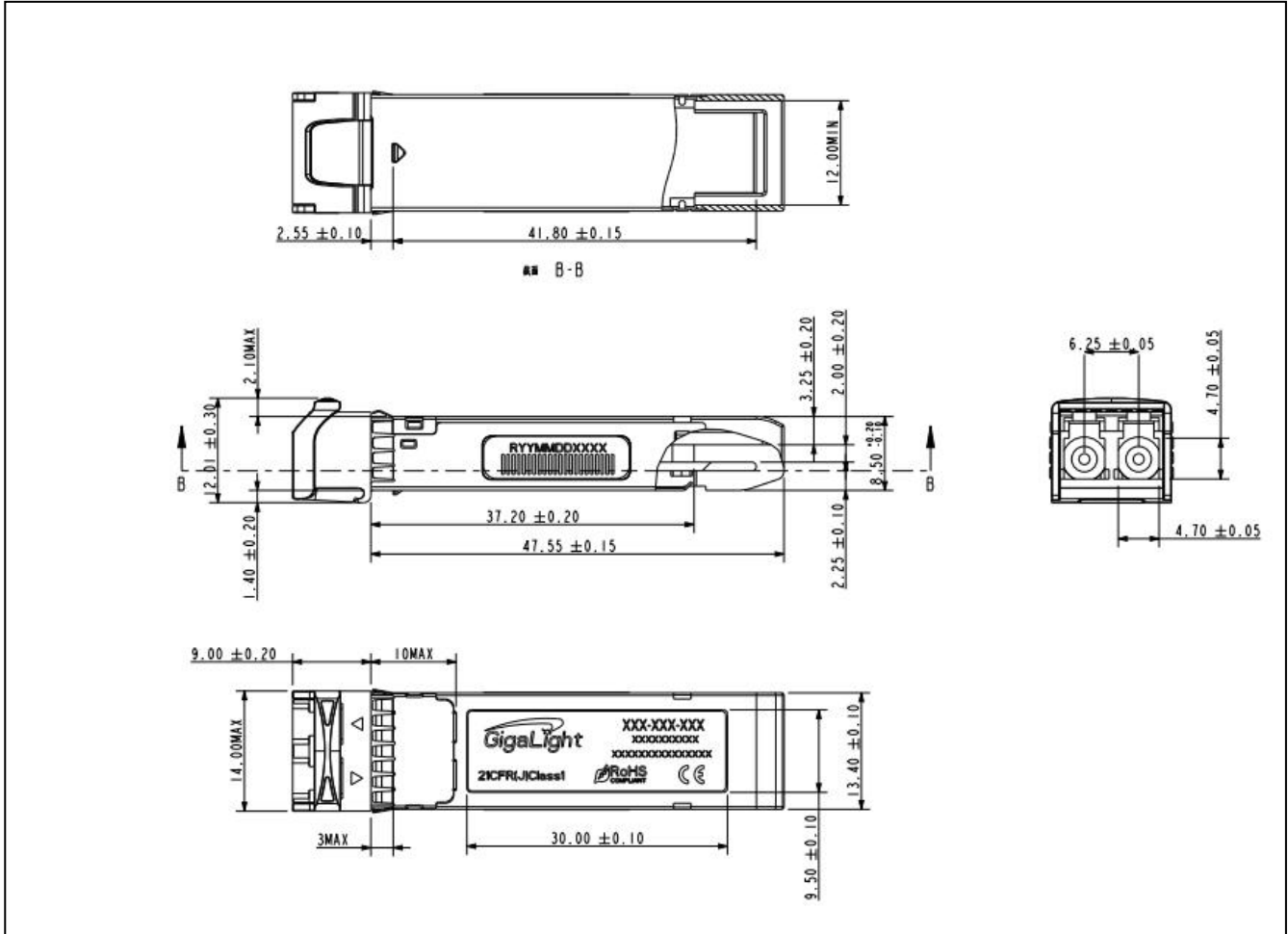
- 1) TX Fault is an open collector output, which should be pulled up with a 4.7k~10kΩ resistor on the host board to a voltage between 2.0V and V_{cc}+0.3V. Logic 0 indicates normal operation; Logic 1 indicates a laser fault of some kind. In the low state, the output will be pulled to less than 0.8V.
- 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 to 0.8V): Transmitter on
 - (>0.8V, < 2.0V): Undefined
 - High (2.0 to 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 V_{ccT} or V_{ccR}.
 - 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
- 4) LOS is an open collector output, which should be pulled up with a 4.7k~10kΩ resistor. Pull up voltage between 2.0V and V_{cc}+0.3V. Logic 1 indicates loss of signal; Logic 0 indicates normal operation. In the low state, the output will be pulled to less than 0.8V.

- 5) RD-/+ : These are the differential receiver outputs. They are internally AC-coupled 100 differential lines which should be terminated with 100Ω (differential) at the user SERDES.
- 6) TD-/+ : These are the differential transmitter inputs. They are internally AC-coupled, differential lines with 100Ω differential termination inside the module.

Recommended Interface Circuit



Mechanical Dimensions



Regulatory Compliance

GIGALIGHT 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 and Laser Notice No. 50	1120295-000
Product Safety	BST	EN 60825-1: 2007 EN 60825-2: 2004 EN 60950-1: 2006	BT0905142001
Environmental protection	SGS	RoHS Directive 2002/95/EC	GZ0902007478/CH EM
EMC	CCIC	EN 55022: 2006+A1: 2007 EN 55024: 1998+A1: 2001+A2: 2003	CTE09020023

Ordering information

Part Number	Product Description
GP-3124-L2C	1310nm, 1.25Gbps, 20km, 0°C ~ +70°C
GP-3124-L2CD	1310nm, 1.25Gbps, 20km, 0°C ~ +70°C, With Digital Diagnostic Monitoring
GP-3124-L2T	1310nm, 1.25Gbps, 20km, -40°C ~ +85°C
GP-3124-L2TD	1310nm, 1.25Gbps, 20km, -40°C ~ +85°C, With Digital Diagnostic Monitoring

References

1. Small Form Factor Pluggable (SFP) Transceiver Multi-Source Agreement (MSA), September 2000.
2. Telcordia GR-253-CORE and ITU-T G.957 Specifications.

Important Notice

Performance figures, data and any illustrative material provided in this data sheet are typical and must be specifically confirmed in writing by GIGALIGHT before they become applicable to any particular order or contract. In accordance with the GIGALIGHT policy of continuous improvement specifications may change without notice.

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Revision History

Version	Date	Description
V0	Oct-18-2011	New release
V1	Nov-22-2018	Use 10shell to instead of 03shell, add EEPROM information
V2	Feb-12-2019	Change receiver sensitivity from -23dbm to -19dbm