SFP 1550nm 2.5Gbps 80km Transceiver

SFP Series

- **Up to 2.5Gb/s Data Links**
- **1550nm DFB laser transmitter**
- **Up to 80km on 9/125pm SMF**
- **Monitoring Interface Compliant with SFF-8472**
- **Single +3.3V power supply**
- **Power consumption 1.5 W**
- **RoHS compliant and Lead Free**

The SFP 2.5Gb/s 1550nm transceiver is a high-performance optical module designed for long-reach transmission up to 80 km over single-mode fiber (SMF). Supporting data rates up to 2.5 Gb/s, it is well suited for telecom and enterprise applications including SONET OC-48 / SDH STM-16 and Fiber Channel links. Its compact, hot-pluggable SFP form factor enables easy integration into a wide range of networking equipment.

The module incorporates a 1550 nm DFB laser transmitter and a high-sensitivity Super TIA receiver, ensuring stable optical performance and extended transmission distance. The optical interface uses a duplex LC connector, while the electrical interface supports a standard SFP connection with a single +3.3V power supply. With low power consumption typically below 1.5W, the transceiver provides an efficient solution for long-distance optical communication.

Compliant with SFF-8472 digital diagnostic monitoring (DDM), the module allows real-time access to critical operating parameters such as temperature, voltage, and optical power. Designed for reliable operation in demanding environments, it supports both commercial (0°C to 70°C) and industrial (-40°C to 85°C) temperature ranges, and is fully RoHS compliant and lead-free, making it suitable for a wide range of carrier and industrial network deployments.

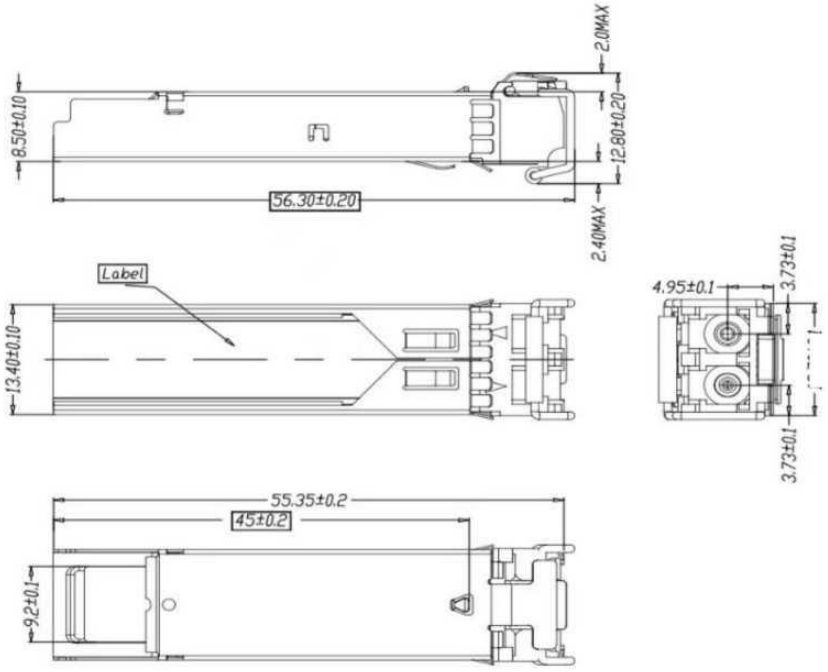
Key Features

- Up to 2.5Gb/s Data Links
- Hot-Pluggable
- 1550nm DFB laser transmitter
- Super Tia receiver
- Duplex LC connector
- Up to 80km on 9/125pm SMF
- Single +3.3V Power Supply
- Monitoring Interface Compliant with SFF-8472
- Low power consumption <1.5W typically
- Operating temperature range:

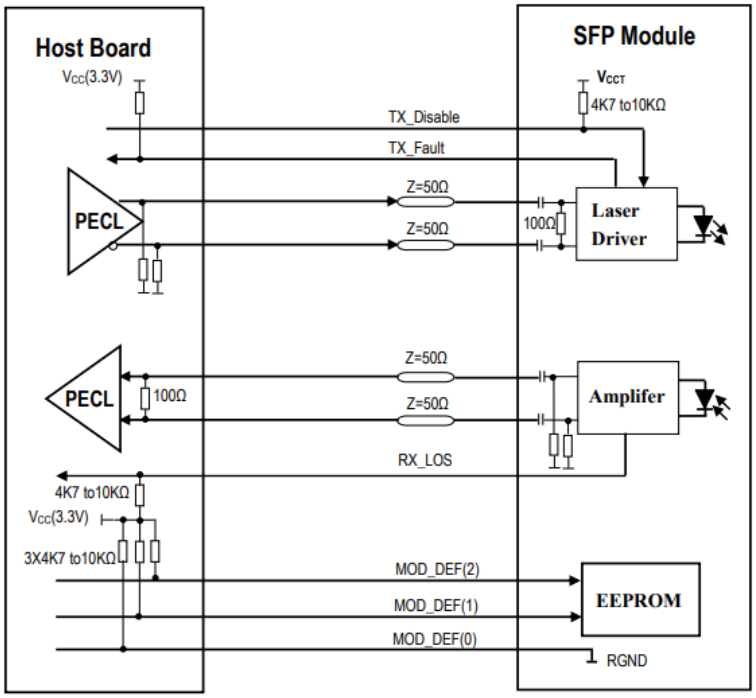
  Commercial: 0°C to 70°C

  Industrial: -40°C to 85°C
- RoHS compliant and Lead Free

Outline Dimensions

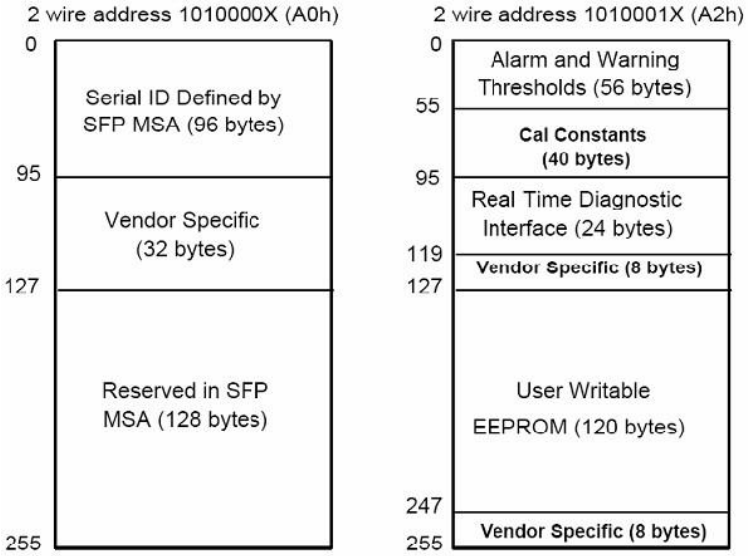


Recommend Circuit Schematic



SFP Module EEPROM Information and Management

The SFP modules implement the 2-wire serial communication protocol as defined in the SFP -8472. 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 below figure. Detailed ID information (A0h) is listed in below table. And the DDM specification is at address A2h. For more details of the memory map and byte definitions, please refer to the SFF-8472, “Digital Diagnostic Monitoring Interface for Optical Transceivers”. The DDM parameters have been internally calibrated.

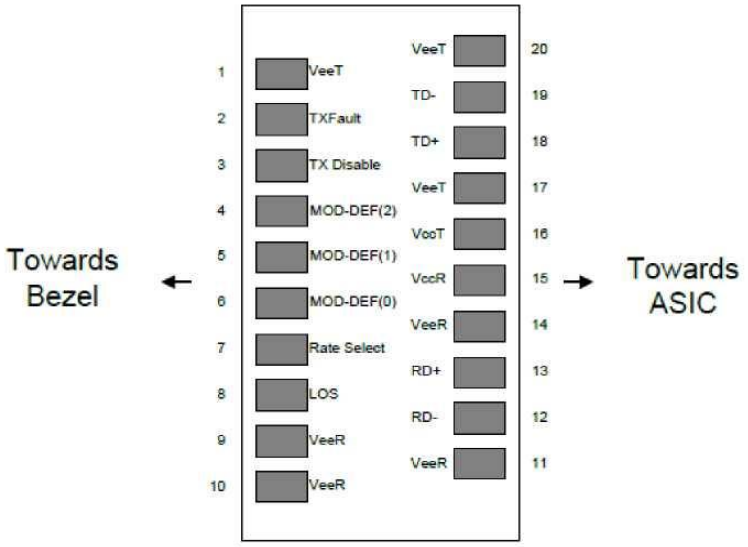


Data Address	Length (Byte)	Name of Length	Description and Contents
Base ID Fields			
0	1	Identifier	Type of Serial transceiver (03h=SFP)
1	1	Reserved	Extended identifier of type serial transceiver (04h)
2	1	Connector	Code of optical connector type (07=LC)
3-10	8	Transceiver	SONET & Fiber Channel
11	1	Encoding	NRZ (03h)
12	1	BR,Nominal	Nominal baud rate, unit of 100Mbps
13	1	Reserved	(0000h)
14	1	Length(9um,km)	Link length supported for 9/125um fiber, units of km
15	1	Length(9um)	Link length supported for 9/125um fiber, units of 100m
16	1	Length(50um)	Link length supported for 50/125um fiber, units of 10m
17	1	Length(62.5um)	Link length supported for 62.5/125um fiber, units of 10m
18	1	Length(Copper)	Link length supported for copper, units of meters
19	1	Reserved	
20-35	16	Vendor Name	SFP vendor name: Lightrend
36	1	Reserved	
37-39	3	Vendor OUI	SFP transceiver vendor OUI ID
40-55	16	Vendor PN	Part Number: “SFP-2G-LP-51-80” (ASCII)
56-59	4	Vendor rev	Revision level for part number
60-61	2	Wavelength	Laser wavelength
62	1	Reserved	
63	1	CCID	Least significant byte of sum of data in address 0-62
Extended ID Fields			
64-65	2	Option	Indicates which optical SFP signals are implemented (001Ah = LOS, TX_FAULT, TX_DISABLE all supported)
66	1	BR, max	Upper bit rate margin, units of %
67	1	BR, min	Lower bit rate margin, units of %
68-83	16	Vendor SN	Serial number (ASCII)
84-91	8	Date code	Manufacturing date code
92	1	Diagnostic Type	Diagnostics
93	1	Enhanced Options	Diagnostics
94	1	SFF-8472	Diagnostics
95	1	CCEX	Check code for the extended ID Fields (addresses 64 to 94)
Vendor Specific ID Fields			
96-127	32	Readable	Vendor specific date, read only
128-255	128	Reserved	Reserved for SFF-8079

Digital Diagnostic Functions

Data Address	Parameter	Accuracy	Unit	Calibration
96-97	Transceiver Internal Temperature	±3.0	°C	internal
98-99	VCC3 Internal Supply Voltage	±5	V	internal
100-101	Laser Bias Current	±10	%	internal
102-103	Tx Output Power	±3.0	dBm	internal
104-105	Rx Input Power	±3.0	dBm	internal

Pin Assignment



Pin	Symbol	Description	Plug Seq.	Notes
1	VeeT	Transmitter Ground	1	1
2	TX Fault	Transmitter Fault Indication	3	
3	TX Disable	Transmitter Disable	3	2
4	MOD-DEF2	Module Definition	2	3
5	MOD-DEF1	Module Definition 1	3	3
6	MOD-DEF0	Module Definition 0	3	3
7	Rate Select	Not Connected	3	4
8	LOS	Loss of Signal	3	5
9	VeeR	Receiver Ground	1	1
10	VeeR	Receiver Ground	1	1
11	VeeR	Receiver Ground		1
12	RD-	Inv. Received Data Out	3	6
13	RD+	Received Data Out	3	6
14	VeeR	Receiver Ground	3	1
15	VccR	Receiver Power	2	1
16	VccT	Transmitter Power	2	
17	VeeT	Transmitter Ground	1	
18	TD+	Transmit Data In	3	6
19	TD-	Inv. Transmit In	3	6
20	VeeT	Transmitter Ground	1	

Notes:

1. Circuit ground is internally isolated from chassis ground.
2. Laser output disabled on TDIS >2.0V or open, enabled on TDIS <0.8V.
3. Should be pulled up with 4.7k - 10 kohms on host board to a voltage between 2.0V and 3.6V.MOD_DEF(0) pulls line low to indicate module is plugged in.
4. Rate select is not used.
5. LOS is open collector output. Should be pulled up with 4.7k - 10 kohms on host board to a voltage between 2.0V and 3.6V. Logic 0 indicates normal operation; logic 1 indicates loss of signal.
6. AC Coupled.

Specifications

Absolute Maximum Ratings

Parameter	Symbol	Min.	Max.	Unit
Storage Temperature	T_s	-40	+85	°C
Maximum Supply Voltage	V_{cc}	-0.5	4.0	V
Operating Relative Humidity	RH	0	85	%

Recommended Operating Conditions

Parameter	Symbol	Min.	Typ.	Max.	Unit	Note
Operating Case Temperature	T_c	0		+70	°C	SFP-2G-LP-51-80
		-40		+85	°C	SFP-2G-LP-51-80A

Optical Characteristics

Parameter	Symbol	Min.	Typ.	Max.	Unit	Note
Transmitter						
Center Wavelength	λ_c	1530	1550	1570	nm	1
Spectral Width(-20dB)	σ			1	nm	
Side Mode Suppression Ratio	SMSR				dB	
Optical Output Power	P_{out}	0		5	dBm	2
Optical Rise/Fall Time	t_r / t_f			260	ps	3
Extinction Ratio	ER	9			dB	
Deterministic Jitter Contribution	TXADJ			56.5	ps	4
Total Jitter Contribution	TXATJ			119	ps	4
Eye Mask for Optical Output	Compliant with IEEE802.3z (class 1 laser safety)					
Receiver						
Optical Input Wavelength		1530		1570	nm	
Optical Input Power	P_{in}	-28		-1	dBm	5,6
Receiver Overload	P_{ol}	-3			dBm	5,6
RX Sensitivity	Sen			-28	dBm	5,6
Receiver Reflectance		12			dB	
RX_LOS Assert	LOS_A	-42			dBm	
RX_LOS Deassert	LOS_D			-29	dBm	
RX_LOS Hysteresis	LOS_H		2	2.5	dB	
General Characteristics						
Data Rate	BR	2125		2500	Mb/s	
Bit Error Rate	BER			10^{-12}		
Max. Supported Link Length on 9/125pm SMF@2.5G	LMAX			80	km	7,8
Total System Budget	LB	26			dB	7,8

Note:

1. Also specified to meet curves in FC-PI 13.0 Figures 18 and 19, which allow trade-off between wavelength spectral widths.

2. Class 1 Laser Safety per FDA/CDRH and EN (IEC) 60825 regulations.
3. Unfiltered, 20-80%. Complies with IEEE 802.3 (Gig. E), FC 1x and 2x eye masks when filtered.
4. Measured with DJ-free data input signal. In actual application, output DJ will be the sum of input DJ and . DJ.
5. Measured with conformance signals defined in FC-PI 13.0 specifications.
6. Measured with PRBS 2^{23-1} at 10^{-12} BER.
7. Dispersion limited per FC-PI Rev. 13.
8. Attenuation of 0.25dB/km is used for the link length calculations. Distances are indicative only. Please refer to the Optical Specifications in Table IV to calculate a more accurate link budget based on specific conditions in your application.

Electrical Characteristics (Top = Tc, Vcc = 3.135 to 3.465 Volts)

Parameter	Symbol	Min.	Typ.	Max.	Unit	Note
Supply Voltage	V_{cc}	3.14	3.30	3.47	V	
Supply Current	I_{cc}			300	mA	
Inrush Current	I_{surge}			I_{cc}+30	mA	
Maximum Power	P_{max}			1.0	W	
Transmitter						
Input Differential Impedance	R_{in}	90	100	110		
Single Ended Data Input Swing	$V_{in\ PP}$	200		1200	mVp-p	
Transmit Disable Voltage	V_D	V_{cc}-1.3		V_{cc}	V	1
Transmit Enable Voltage	V_{EN}	Vee		V_{ee}+0.8	V	
Transmit Disable Assert Time	$T_{dessert}$			10	us	
Receiver						
Single Ended Data Output Swing	$V_{out,pp}$	300		1000	mv	2
Data Output Rise Time	t_r			260	ps	
Data Output Fall Time	t_f			260	ps	
LOS Fault	$V_{losfault}$	V_{cc}-0.5		V_{CC_host}	V	3
LOS Normal	$V_{los\ norm}$	V_{ee}		V_{ee}+0.5	V	3
Power Supply Rejection	PSR	100			mVpp	
Deterministic Jitter	RXADJ			51.7	ps	
Total Jitter Contribution	RXATJ			122.4	ps	

Note:

1. Or open circuit.
2. Into 100 ohm differential termination.
3. LOS is LVTTL. Logic 0 indicates normal operation; logic 1 indicates no signal detected.

Ordering Information

Product Name	Product Description
SFP-2G-LP-51-80	SFP Plug-in, 2.5Gbps, 80km, TX=1550/RX wide, on two single mode fibres, LC/PC blue
SFP-2G-LP-51-80A	SFP Plug-in, 2.5Gbps, 80km, TX=1550/RX wide, on two single mode fibres, LC/PC blue, Industrial Temp -40 to +85°C

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