4.25Gbps SFP Optical Transceiver, 30km Reach
SFP-9530-31

Features

- Single 3.3 V supply
- Supports 1.0625/2.125/4.25Gb/s Fiber Channel Operation
- Gigabit Ethernet compatible
- 1310nm DFB Laser
- SFP MSA SFF-8074i compliant
- Digital Diagnostic SFF-8472 compliant
- Compatible with RoHS
- Operating case temperature:

  Standard: 0 to +70°C

  Industrial: -40 to +85°C

Applications

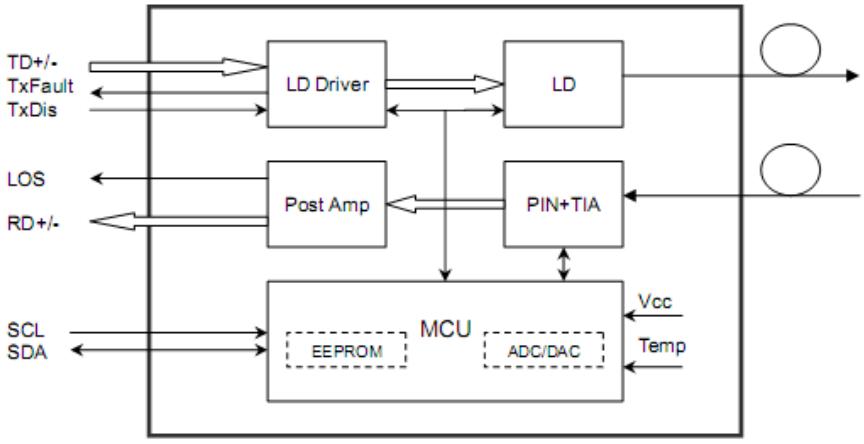
• Tri Rate 1.0625 / 2.125 / 4.25Gbp/s Fiber Channel

• 1.25Gbp/s 1000Base-LX Ethernet and 1000Base-LX10 (Rate selectable version)

Description

The transceiver consists of three sections: a DFB 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 the Small Form Factor Pluggable Multi-Sourcing Agreement (MSA)1. They are compatible with Fiber Channel per FC-PI-2 Rev. 10.0 and also simultaneously compatible with Gigabit Ethernet as specified in IEEE Std 802.3.

Module Block Diagram



Absolute Maximum Ratings

Table 1 - Absolute Maximum Ratings

Parameter	Symbol	Min.	Max.	Units	Notes
Power Supply Voltage	Vcc-Vee	0	3.6	V	-
Storage Temperature	Tst	-40	+85	°C	-
Operating Humidity	RH	5	90	%	Non-condensing

Recommended Operating Conditions

Table 2 - Recommended Operating Conditions

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

Optical and Electrical Characteristics

Table 3 - Optical and Electrical Characteristics

Parameter		Symbol	Min	Typical	Max	Unit	Notes
Transmitter							
Data Rate				4.25		Gb/S	
Centre Wavelength		λc	1260	1310	1360	nm	
Spectral Width (-20dB)		Δλ			1	nm	
Side Mode Suppression Ratio		SMSR	30			dB	
Average Output Power(BOL)		Pout	0		5	dBm	1
Extinction Ratio		ER	5			dB	
Average Launch Power-OFF Transmitter		Pout			-40	dBm	
Optical Eye Diagram		Fiber Channel Compliant					
Optical Rise/Fall Time (20%~80%)		t_r/t_f			130	ns	
Data Input Swing Differential		V_{IN}	200		2400	mV	2
Input Differential Impedance		Z_{IN}	90	100	120	Ω	
TX Disable	Disable		2.0		Vcc	V	
	Enable		0		0.8	V	
TX Fault	Fault		2.0		Vcc	V	
	Normal		0		0.8	V	

Receiver						
Centre Wavelength	λc	1260		1360	nm	
Receiver Sensitivity(BOL)	Sen			-18	dBm	3
LOS De-Assert	LOS_D			-18	dBm	
LOS Assert	LOS_A	-28			dBm	
LOS Hysteresis		0.5		6	dB	
Receiver Reflectance				-20	dB	
Data Output Swing Differential	V_{out}	350		1800	mV	4
Loss of Signal (LOS) Assert Time	TAssert			500	nS	
Loss of Signal (LOS) Deassert Time	TDeassert			500	nS	
LOS	High	2.0		Vcc	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 2^7-1 test pattern @4250Mbps, BER ≤1×10^{-12}.
4. CML Output,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		Vcc	V
MOD_DEF (0:2)-Low	V_L			0.8	V

Diagnostics

Table 5 – Diagnostics Specification

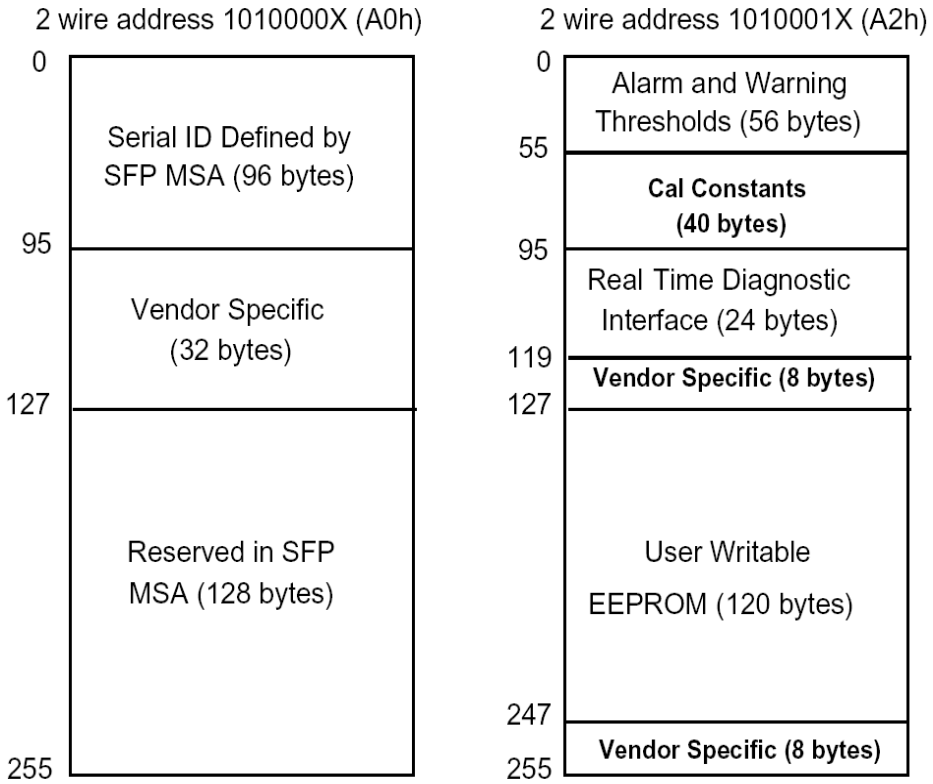
Parameter	Range	Unit	Accuracy	Calibration
Temperature	0 to +70	°C	±3°C	Internal / External
	-40 to +85			
Voltage	3.0 to 3.6	V	±3%	Internal / External
Bias Current	0 to 100	mA	±10%	Internal / External
TX Power	-9 to -3	dBm	±3dB	Internal / External
RX Power	-23 to -3	dBm	±3dB	Internal / External

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).

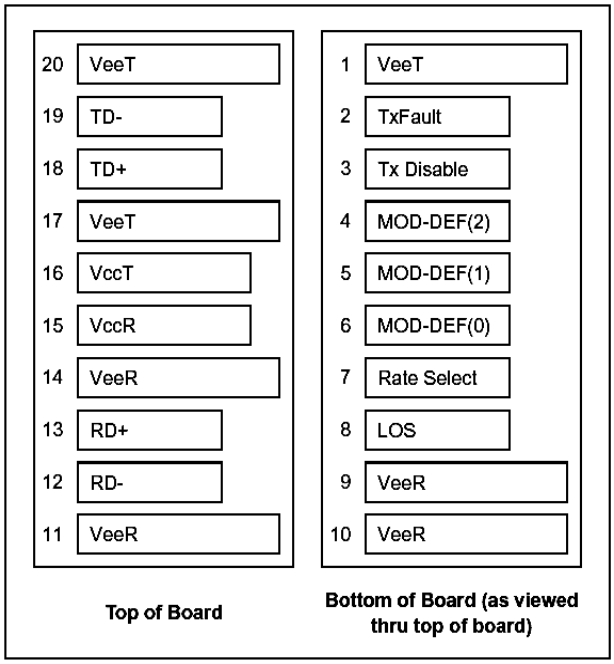
The diagnostic information with internal calibration or external calibration all are implemented, including received power monitoring, transmitted power monitoring, bias current monitoring, supply voltage monitoring and temperature monitoring.

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



Pin Definitions

Pin Diagram



Pin Descriptions

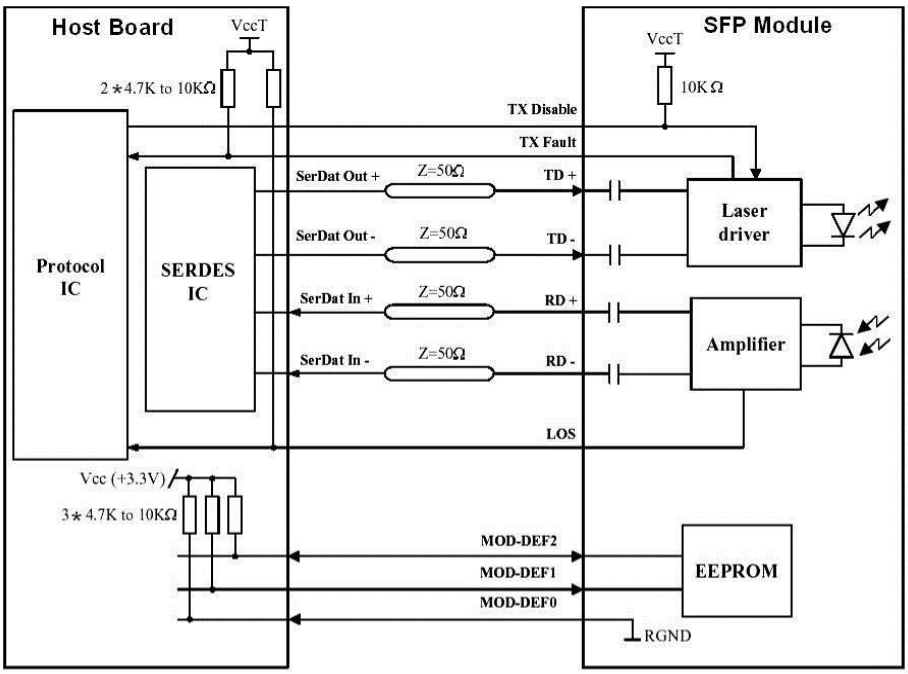
Pin	Signal Name	Description	Plug Seq.	Notes
1	V_{EET}	Transmitter Ground	1	
2	TX FAULT	Transmitter Fault Indication	3	Note 1
3	TX DISABLE	Transmitter Disable	3	Note 2
4	MOD_DEF(2)	SDA Serial Data Signal	3	Note 3
5	MOD_DEF(1)	SCL Serial Clock Signal	3	Note 3
6	MOD_DEF(0)	TTL Low	3	Note 3
7	Rate Select	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:

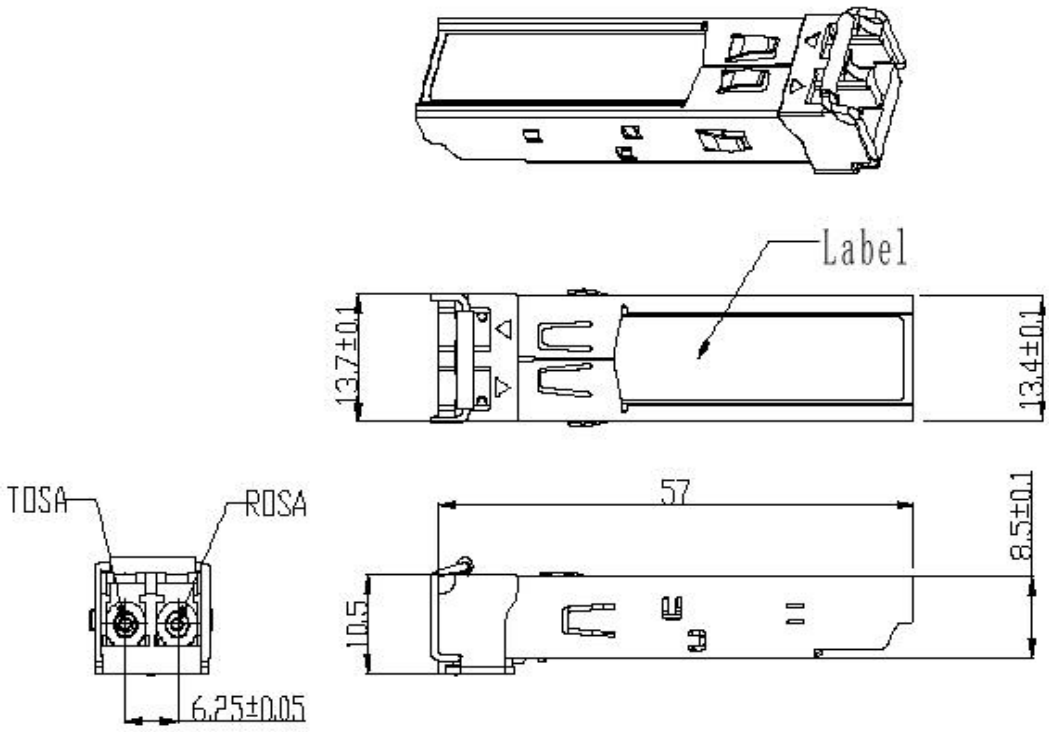
Plug Seq.: Pin engagement sequence during hot plugging.

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 Vcc+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 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 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 Vcc+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

The 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 annd 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/CHEM
EMC	CCIC	EN 55022：2006+A1：2007 EN 55024：1998+A1：2001+A2：2003	CTE09020023

Ordering information

Part Number	Product Description
SFP-9530-31	1310nm, 4.25Gbps, 30km, 0ºC ~ +70ºC, With Digital Diagnostic Monitoring
SFP-9530-31-I	1310nm, 4.25Gbps, 30km, -40ºC ~ +85ºC, 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.

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