155M SFP Transceiver
SFP-FE-S31L-20D

Features

- Up to 20 km transmission on SMF
- Up to155Mbps
- 1310nm FP laser and PIN receiver
- 2-wire interface for integrated Digital Diagnostic monitoring
- Hot pluggable
- Very low EMI and excellent ESD protection
- +3.3V power supply
- Power consumption less than 1.0W
- Operating case temperature: -40~+85°C

Applications

- High-speed storage area networks
- Computer cluster cross-connect
- Custom high-speed data pipes

Compliance

- Compliant with ITU-T G.957
- Compliant with MSA SFF-8472
- Compliant with SFP MSA

Description

SFP-FE-S31L-20D is a high performance, cost effective modules, which is supporting up to 155Mbps, and transmission distance up to 20km on SM fiber. The transceiver consists of two sections: The transmitter section incorporates a laser driver and a 1310nm FP laser. The receiver section consists of a PIN photodiode integrated with a transimpedance preamplifier (TIA) and a Limitting Amplifier. The module is hot pluggable into the 20-pin connector. The high-speed electrical interface is base on low voltage logic, with nominal 100Ohms differential impedance and AC coupled in the module.

The optical output can be disabled by LVTTL logic high-level input of TX_DIS. Transmit Fault (Tx_Fault) is provided to indicate that the module transmitter has detected a fault condition related to laser operation or safety. Loss of signal (RX_LOS) output is provided to indicate the loss of an input optical signal of receiver. A serial EEPROM in the transceiver allows the user to access transceiver monitoring and configuration data via the 2-wire SFP Management Interface. This interface uses a single address, A0h, with a memory map divided into a lower and upper area. Basic digital diagnostic (DD) data is held in the lower area while specific data is held in a series of tables in the high memory area.

Specification

Absolute Maximum Ratings

Parameter	Symbol	Min.	Max.	Unit	Notes
Storage Temperature	T_S	-40	+85	℃	
Supply Voltage	V_{CC3}	0	3.6	V	
Relative Humidity	RH	5	+85	%	Note1
Rx Input Average Power	Pmax	-	+1	dBm	

Notes:
[1] Non-condensing state.

Recommended Operating Conditions

Parameter	Symbol	Min.	Typical	Max.	Unit
Operating Case Temperature	T_C	0	25	+70	℃
Power Supply Voltage	V_{CC3}	3.13	3.3	3.47	V
Total Supply Current	I_{CC3}	-	-	300	mA
Power Dissipation	P_D	-	-	1.0	W
Data Rate			155		Mbps
Transmission Distance		-	-	20	Km

Transmitter Operating Characteristic-Optical, Electrical

Parameter	Symbol	Min.	Typical	Max.	Unit	Note
Centre Wavelength	λ_C	1260	1310	1355	nm	
Spectral Width	$\Delta\lambda$			4	nm	FP (RMS)
Average Optical Power	Pavg	-15	-	-8	dBm	
Laser Off Power	Poff	-	-	-40	dBm	
Extinction Ratio	ER	8.2	-	-	dB	
Operating Data Rate		-	155	-	Mbps	
Optical Eye Mask	Complies with ITU-T G.957 eye masks when filtered					
Tx Input Diff. Voltage	VI	500	-	2400	mV	
Tx Fault Output Voltage -- Low	VoL	-0.3	-	0.4	V	
Tx Fault Output Voltage -- High	VoH	2.4	-	Vcc+0.3	V	

Receiver Operating Characteristic-Optical, Electrical

Parameter	Symbol	Min.	Typ.	Max.	Unit	Note
Center Wavelength	λr	1260		1620	nm	
Receive Sensitivity In Average Power	Psen	-	-	-32	dBm	
Los Assert	LosA	-45	-	-	dBm	
Los Dessert	LosD	-	-	-33	dBm	
Los Hysteresis	LosH	0.5	-	-6	dB	
Overload	Pin	-5			dBm	
Rx Output Diff Voltage	Vo	370	-	2000	mV	

Operating Data Rate	-	-	155	-	Mbps	

Digital Diagnostic Functions

Parameter	Symbol	Min.	Max.	Unit	Note
Temperature monitor absolute error	DMI_Temp	-3	3	℃	Over operating temp
Laser power monitor absolute error	DMI_TX	-3	3	dB	
RX power monitor absolute error	DMI_RX	-3	3	dB	
Supply voltage monitor absolute error	DMI_VCC	-3%	+-3%	V	
Bias current monitor absolute error	DMI_Ibias	-10%	10%	mA	

Control and Status I/O Timing Characteristics

Parameter	Symbol	Min.	Max.	Unit	Note
TX Disable Assert Time	t_off	-	100	μs	Note1
TX Disable Negate Time	t_on	-	2	ms	Note2
Time to initialize including reset of TX_Fault	t_init	-	300	ms	Note3
TX Fault Assert Time	t_fault_on	-	1	ms	Note4
TX Fault Reset Time	t_reset	10	-	μs	Note5
LOS Assert Time	t_loss_on	-	100	μs	Note6
LOS Deassert Time	t_loss_off	-	100	μs	Note7

Notes:

[1] Time from rising edge of TX Disable to when the optical output falls below 10% of nominal

[2] Time from falling edge of TX Disable to when the modulated optical output rises above 90% of nominal

[3] From power on or negation of TX Fault using TX Disable

[4] Time from fault to TX fault on

[5] Time from TX fault to TX nominal

[6] Time from LOS state to RX LOS assert

[7] Time from non-LOS state to RX LOS deassert.

Pin-out Definition

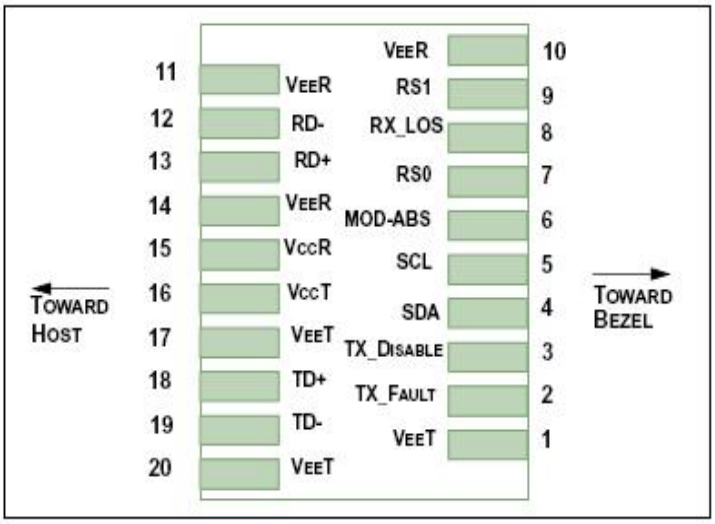


Figure1

Pin Assignment

Pin	Logic	Symbol	Name/Description	Note
1		VeeT	Module Transmitter Ground	Note1
2	LVTTL-O	TX_Fault	Module Transmitter Fault	Note2
3	LVTTL-I	TX_Disable	Transmitter Disable; Turns off transmitter laser output	Note3
4	LVTTL-I/O	SDA	2-wire Serial Interface Data Line (Same as MOD-DEF2 as defined in the INF-8074i)	Note4
5	LVTTL-I/O	SCL	2-wire Serial Interface Clock (Same as MOD-DEF1 as defined in the INF-8074i)	Note4
6		MOD_ABS	Module Absent, connected to VeeT or VeeR in the module	Note5
7	LVTTL-I	RS0	Not used	
8	LVTTL-O	RX_LOS	Receiver Loss of Signal Indication (In FC designated as RX_LOS, in SONET designated as LOS, and in Ethernet designated at Signal Detect)	Note2
9	LVTTL-I	RS1	Not used	
10		VeeR	Module Receiver Ground	Note1
11		VeeR	Module Receiver Ground	Note1
12	CML-O	RD-	Receiver Inverted Data Output	
13	CML-O	RD+	Receiver Non-Inverted Data Output	
14		VeeR	Module Receiver Ground	Note1
15		VccR	Module Receiver 3.3 V Supply	
16		VccT	Module Transmitter 3.3 V Supply	
17		VeeT	Module Transmitter Ground	Note1
18	CML-I	TD+	Transmitter Non-Inverted Data Input	
19	CML-I	TD-	Transmitter Inverted Data Input	
20		VeeT	Module Transmitter Ground	Note1

Block Diagram of Transceiver

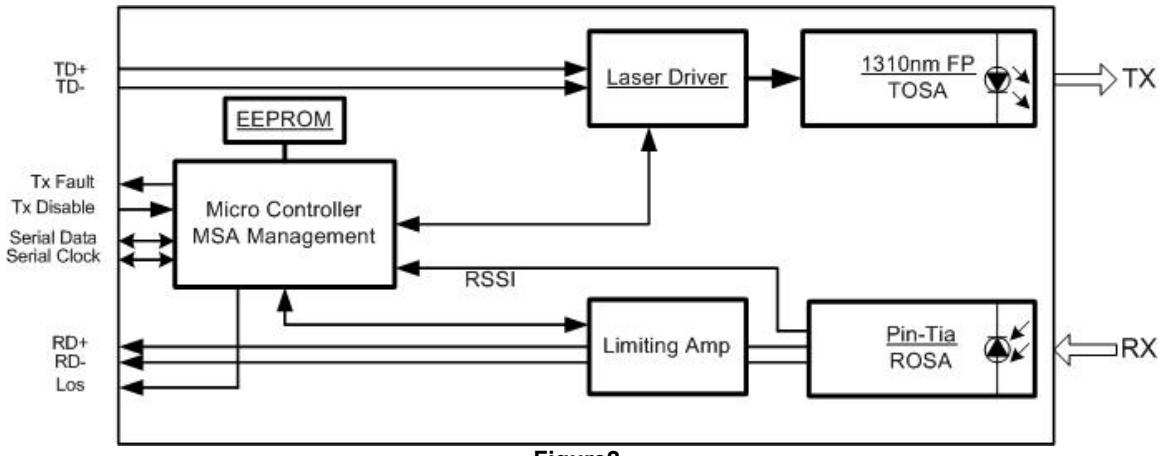


Figure2

Note

[1] TX Fault is open collector/drain output which should be pulled up externally with a 4.7K – 10KΩ resistor on the host board to supply <VccT+0.3V or VccR+0.3V. When high, this output indicates a laser fault of some kind. Low indicates normal operation. In the low state, the output will be pulled to <0.8V.

[2] TX Disable input is used to shut down the laser output per the state table below. It is pulled up within the module with a 4.7 – 10K resistor.

Low (0 – 0.8V): Transmitter on

Between (0.8V and 2V): Undefined

High (2.0 – VccT): Transmitter Disabled

Open : Transmitter Disabled

[3] Mod-Def 0, 1, 2. These are the module definition pins. They should be pulled up with a 4.7 - 10K resistor on the hostboard to supply less than VccT+0.3V or VccR+0.3V.

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

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

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

[4] LOS (Loss of signal) is an open collector/drain output which should be pulled up externally with a 4.7 - 10K resistor on the host board to supply <VccT+0.3V or VccR+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] 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 thus not required on the host board.

[6] VccR and VccT are the receiver and transmitter power supplies. They are defined as 3.3V±5% at the SFP connector pin. The in-rush current will typically be no more than 30mA above steady state supply current after 500ns.

[7] 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 host board.

Recommended Interface Circuit

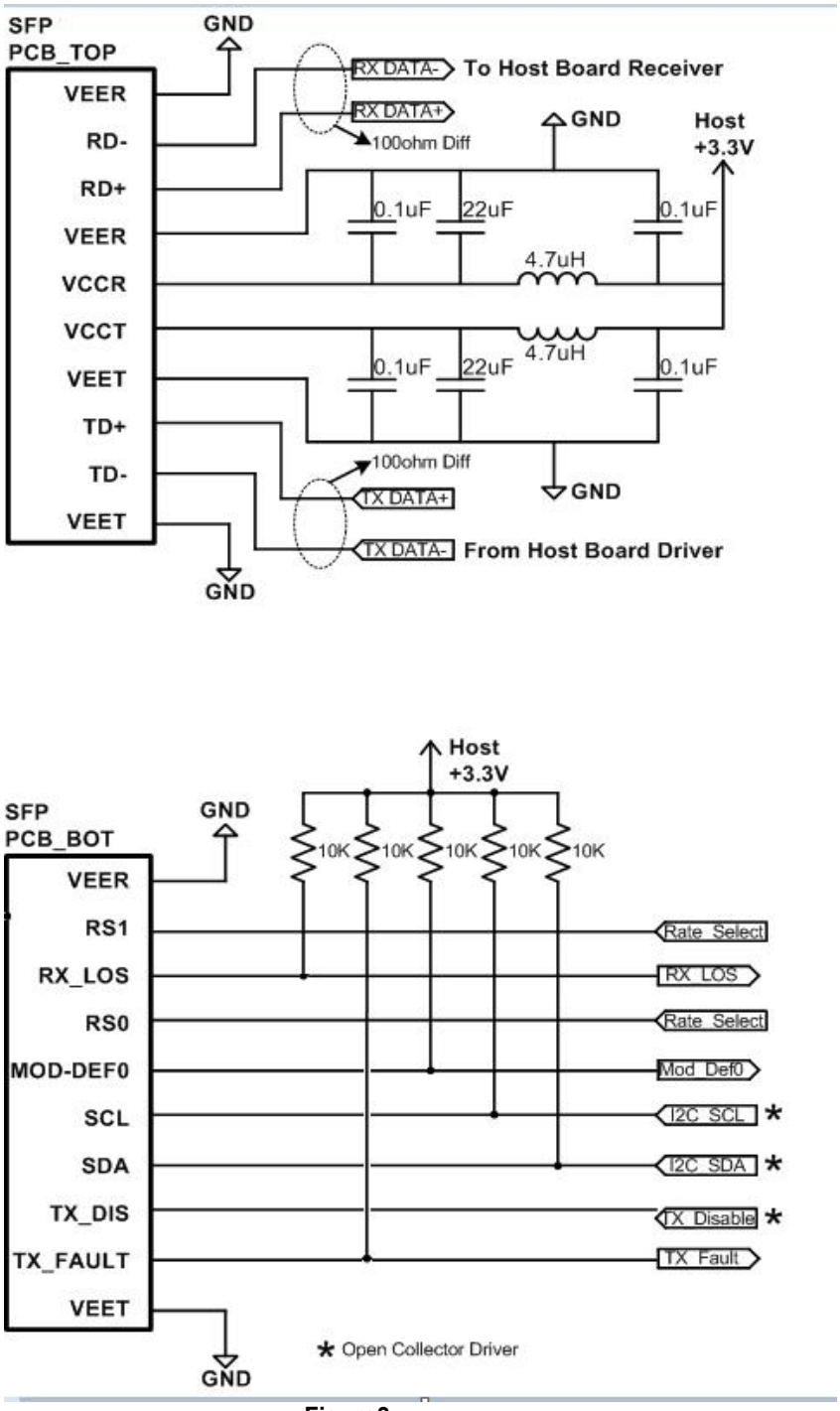
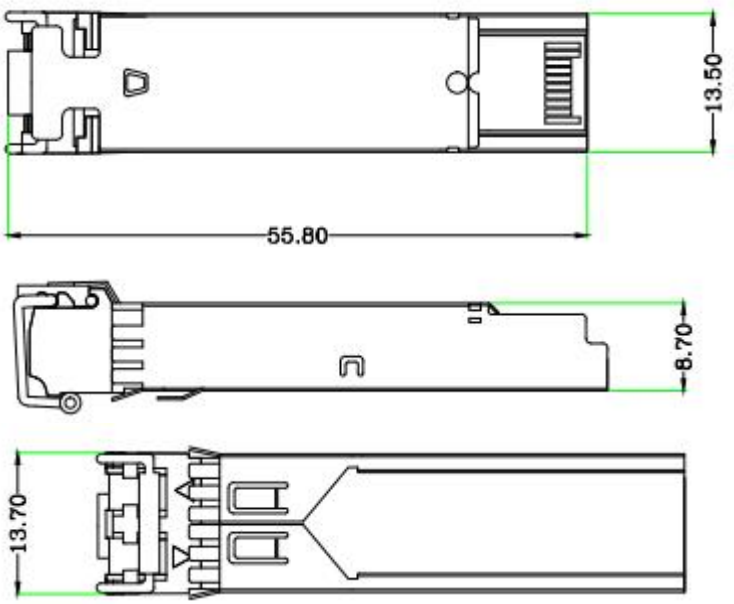


Figure3

Dimensions

Uint:mm



Tolerance: X.X±0.10 X.XX±0.05 X.XXX±0.01

Figure4

Digital Diagnostic Memory Map

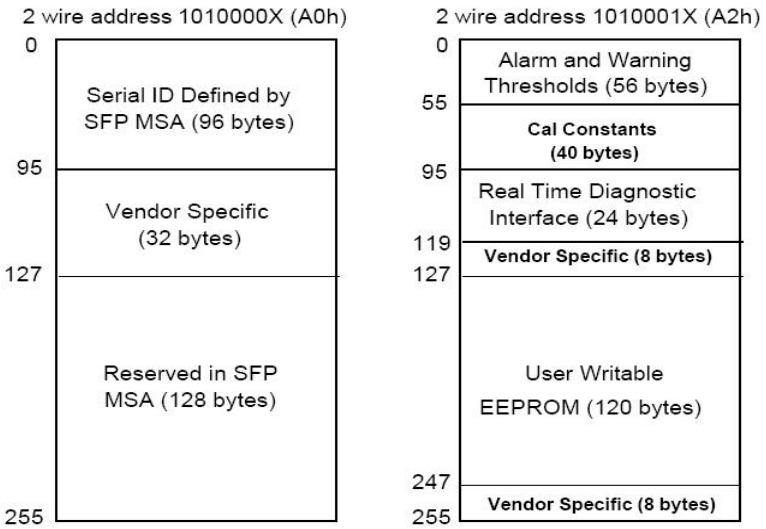


Figure5