NS-SFP-STM1-L20D
155Mbps SFP 1310nm 20km

Features

- Up to 155Mbps data-rate
- 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 RoHS
- +3.3V single power supply
- Operating case temperature:
- Standard : -5 to +70°C
- Industrial : -40 to +85°C

Applications

SDH STM-1, S-1.1,L-1.1, L-1.2
SONET OC-3 IR1,LR1,LR2
Other optical links

Description

The SFP transceivers are high performance, cost effective modules supporting 155Mbps data-rate 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.
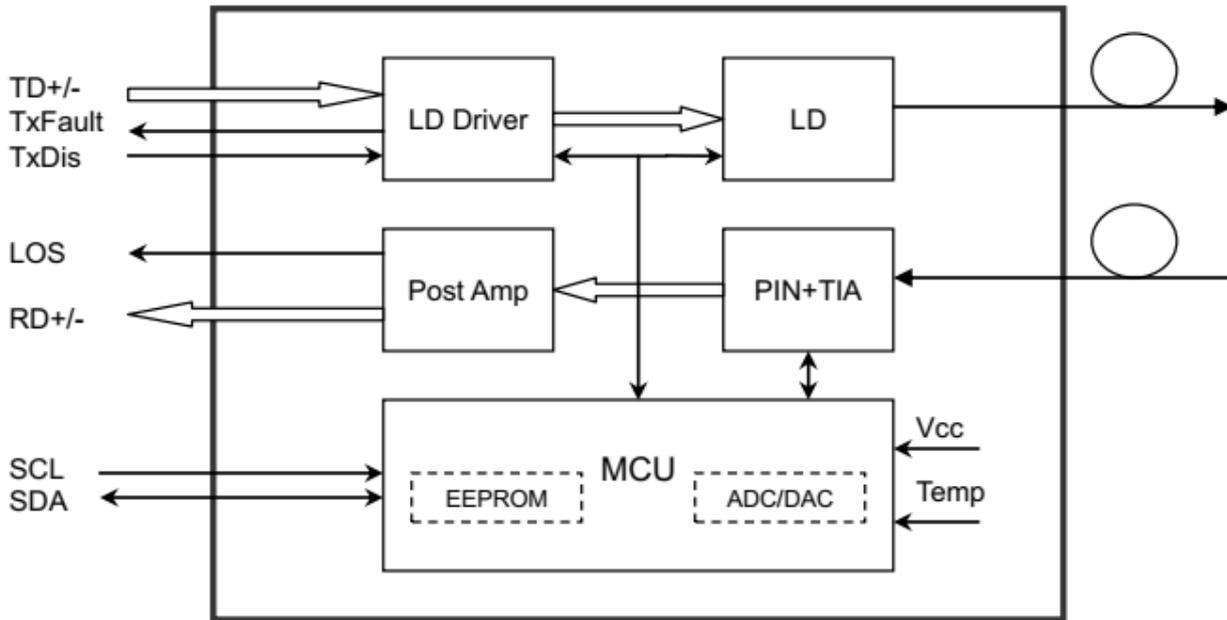
Absolute Maximum Ratings

Table 1 - Absolute Maximum Ratings

Parameter	Symbol	Min	Max
Supply Voltage	Vcc	-0.5	4.5
Storage Temperature	Ts	-40	+85
Operating Humidity	-	5	85

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
Data Rate				155		Mbp

Optical and Electrical Characteristics

NS-SFP-STM1-L20D: (FP and PIN, 1310nm, 20km Reach)
Table 3 - Optical and Electrical Characteristics

Parameter		Symbol	Min	Typical	Max	Unit	Notes
Transmitter							
Centre Wavelength		λc	1260	1310	1360	nm	-
Spectral Width (RMS)		Δλ	-	-	4	nm	-
Average Output Power		Pout	-14	-	-8	dBm	1
Extinction Ratio		ER	9	-	-	dB	-
Data Input Swing Differential		VIN	400	-	1800	mV	2
Input Differential Impedance		ZIN	90	100	110	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	-	1580	nm	-
Receiver Sensitivity		-32	-	-	-32	dBm	3
Receiver Overload		-3	-3	-	-	dBm	3
LOS De-Assert		LOSD	-	-	-34	dBm	-
LOS Assert		LOSA	-45	-	-	dBm	-
LOS Hysteresis		1	1	-	4	dB	-
Data Output Swing Differential		Vout	370	-	1800	mV	4
LOS	High		2.0	-	Vcc	V	-
	Low		0.8	-	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_{23}-1 test pattern @155Mbps, BER ≤1×10$_{-10}$
4. Internally AC-coup

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	VH	2	-	Vcc	V
MOD_DEF (0:2)-Low	VL	-	-	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	-14 to -8	dBm	±3dB	Internal / External
RX Power	-28 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.

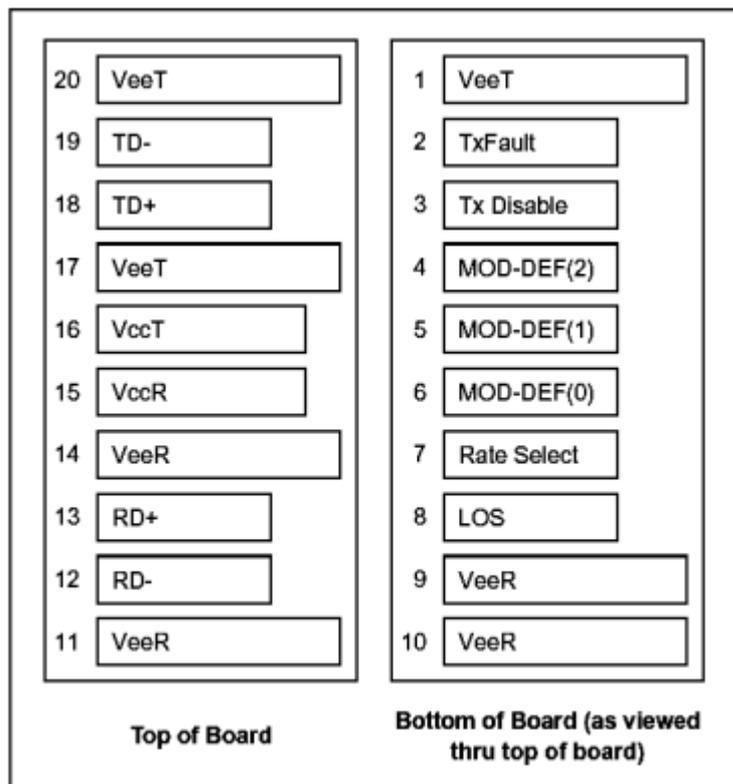The digital diagnostic memory map specific data field defines as following.
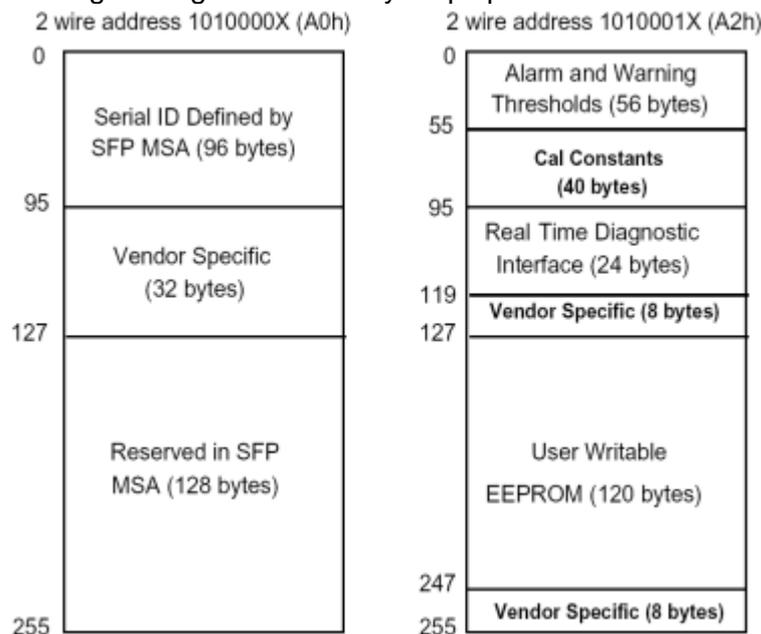
Pin Definitions

Pin Diagram

20	VeeT
19	TD-
18	TD+
17	VeeT
16	VccT
15	VccR
14	VeeR
13	RD+
12	RD-
11	VeeR

Top of Board

1	VeeT
2	TxFault
3	Tx Disable
4	MOD-DEF(2)
5	MOD-DEF(1)
6	MOD-DEF(0)
7	Rate Select
8	LOS
9	VeeR
10	VeeR

Bottom of Board (as viewed thru top of board)

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.
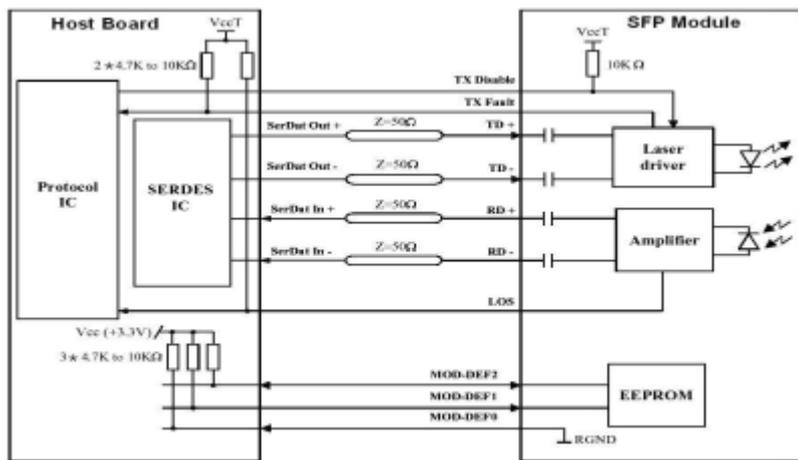
6) TD-/+: These are the differential transmitter inputs. They are internally AC-coupled, differential lines with 100Ω differential termination inside the module.
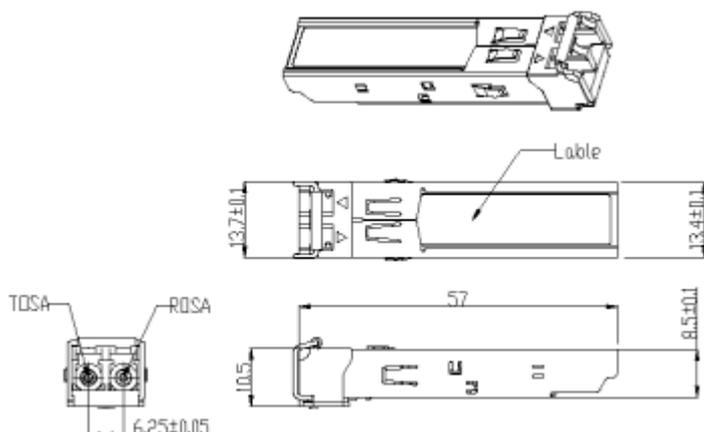
Recommended Interface Circuit

Mechanical Dimensions

Ordering information

Part Number	Product Description
NS-SFP-STM1-L20	1310nm, 155Mbps, 20km, 0ºC ~ +70ºC
NS-SFP-STM1-L20D	1310nm, 155Mbps, 20km, 0ºC ~ +70ºC, With Digital Diagnostic Monitoring
NS-SFP-STM1-L20I	1310nm, 155Mbps, 20km, -40ºC ~ +85ºC
NS-SFP-STM1-L20DI	1310nm, 155Mbps, 20km, -40ºC ~ +85ºC, With Digital Diagnostic Monitoring