

10G SFP Module-S

Optical Module



Specifications

Change History

Document Version	Release Date	Description
V1.0.0	2023-03-20	First release

Product Features

- Hot Pluggable SFP+ form factor
- Supports 10.3125Gb/s operation
- Low Power Dissipation, Max 1.2W
- Operating Case Temperature: 0°C to 70°C
- Duplex LC receptacle
- Up to 10km transmission with SMF
- SFF-8472 Management Interface
- SFF-8432: Pluggable Module
- SFF-8431: General Electrical
- GR-468: Reliability Qualification
- IEEE 802.3ae: Physical Layer Specifications and Management Parameters

Applications

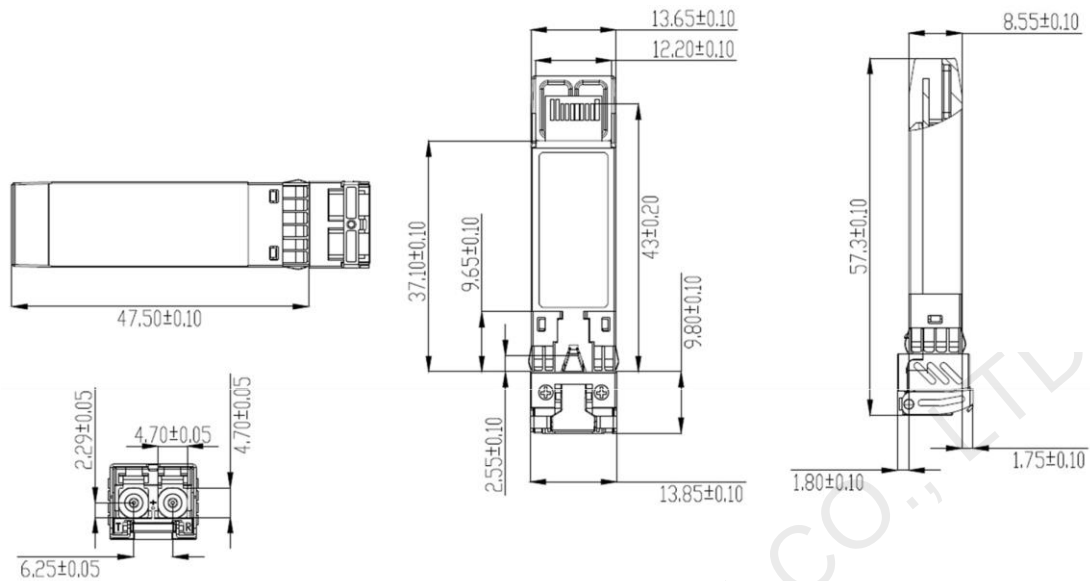
- Ethernet for 10GBASE-LR
- InfiniBand QDR, DDR, SDR

General Product Characteristics

Parameter	Value	Unit	Comments
Module Form Factor	SFP+	As defined by SFF-8432	Module Form Factor
Maximum Aggregate Data Rate	10.3125	Gb/s	
Protocols Supported	InfiniBand, Ethernet		
Electrical Interface and Pin-out	20-pin edge connector		Pin-out as defined by SFF-8419
Maximum Power Consumption per End	1.2	Watts	Varies with output voltage swing and pre-emphasis settings
Management Interface	Serial, I2C-based, 400 kHz maximum frequency		As defined by SFF-8472

Mechanical Specification

Product shall be of design, construction and physical dimensions specified on applicable product drawing.



Absolute Maximum Parameters

Exceeding the limits below may damage the optical transceiver module permanently.

Parameter	Symbol	Min.	Typ.	Max.	Unit.	Ref.
Maximum Supply Voltage	V _{CC}	-0.5		3.6	V	
Storage Temperature	T _{sto}	-40		85	°C	
Case Operating Temperature	T _{op}	0		70	°C	
Relative Humidity	RH	15		85	%	a)

a) No-condensing

Parameters

Parameter	Symbol	Min.	Typ.	Max.	Unit.	Ref.
Supply Voltage	V _{CC}	3.14		3.46	V	
Power Consumption	P _{Con}			1.2	W	
Bit Rate	BR		10.3125		Gb/s	a)
Bit Error Ratio	BER			10 ⁻¹²		b)
Management Interface		Serial, I2C-based, maximum frequency 400 kHz				c)
Logic Input Voltage High	V _{ih}	2		V _{CC} +0.3	V	
Logic Input Voltage Low	V _{il}	-0.3		0.8	V	

a) Single lane

b) PRBS = 2³¹-1 @ 10.3125Gb/s

c) As defined by SFF-8472

Electrical Characteristics

Parameter	Symbol	Min.	Typ.	Max.	Unit.	Ref.
Transceiver Power Supply Current	I_{cc}			350	mA	
Transceiver Power On Initialization Time	T_{init}			300	ms	
Transmitter at TP1a						
Differential Data Input Voltage Peak to Peak Swing	$V_{in,pp}$	180		700	mV	
Differential Input Impedance	Z_{in}	90	100	110	Ohms	
Differential Input Return Loss	SDD11	$< -12 + 2 \times \text{SQRT}(f), f \text{ in GHz}$			dB	0.01-4.1GHz
		$< -6.3 + 13 \times \log_{10}\left(\frac{f}{5.5}\right), f \text{ in GHz}$			dB	4.1-11.1GHz
Differential to Common Mode Loss	SCD11			-10	dB	0.01-11.1GHz
Receiver at TP4						
Differential Data Output Voltage Peak to Peak Swing	V_{opp}	300		850	mV	
Differential Output Impedance	Z_{out}	90	100	110	Ohms	
Differential Output Return Loss	SDD22	$< -12 + 2 \times \text{SQRT}(f), f \text{ in GHz}$			dB	0.01-4.1GHz
		$< -6.3 + 13 \times \log_{10}\left(\frac{f}{5.5}\right), f \text{ in GHz}$			dB	4.1-11.1GHz
Common Mode Output Return Loss	SCC22	$< -7 + 1.6 \times f, f \text{ in GHz}$			dB	0.01-2.5GHz
				-3	dB	2.5-11.1GHz
Output Rise and Fall time (20% to 80%)	T_r, T_f	28			ps	

Optical Characteristics

Parameter	Symbol	Min.	Typ.	Max.	Unit.	Ref.
Transmitter						
Signaling Speed lane		10.3125 ± 100ppm			Gb/s	
Optical wavelength	λ	1270	1310	1350	nm	
Spectral Width (-20dB)	$\Delta\lambda$			1	nm	
Average launch power	P_{avg}	-6.5		0.5	dBm	
Optical Extinction Ratio	ER	3.5			dB	
Transmitter and Dispersion Penalty	TDP			3.9	dB	
Average Launch Power of OFF Transmitter	P_{OFF}			-30	dBm	
Relative Intensity Noise	RIN_{12OMA}			-128	dB/Hz	
Receiver						
Signaling Speed lane		10.3125 ± 100ppm			Gb/s	
Optical wavelength	λ	1270	1310	1350	nm	
Receiver Sensitivity (OMA)	$RxSen.$			-14.4	dBm	a)
Maximum Input Power	P_{MAX}	+0.5			dBm	
LOS De-Assert	LOS_D			-15.5	dBm	
LOS Assert	LOS_A	-30			dBm	
LOS Hysteresis		0.5			dB	

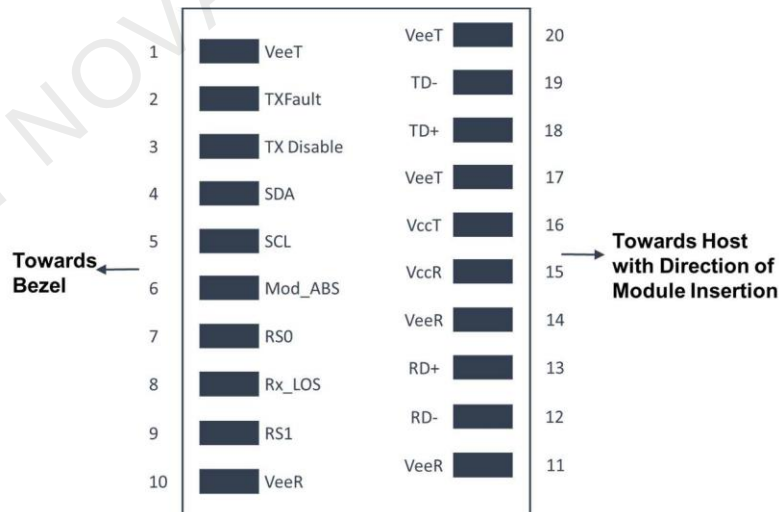
a) Measure with worst ER, $BER < 10^{-12}$, $2^{31}-1$ PRBS.

Pin Descriptions (compliant SFF-8431)

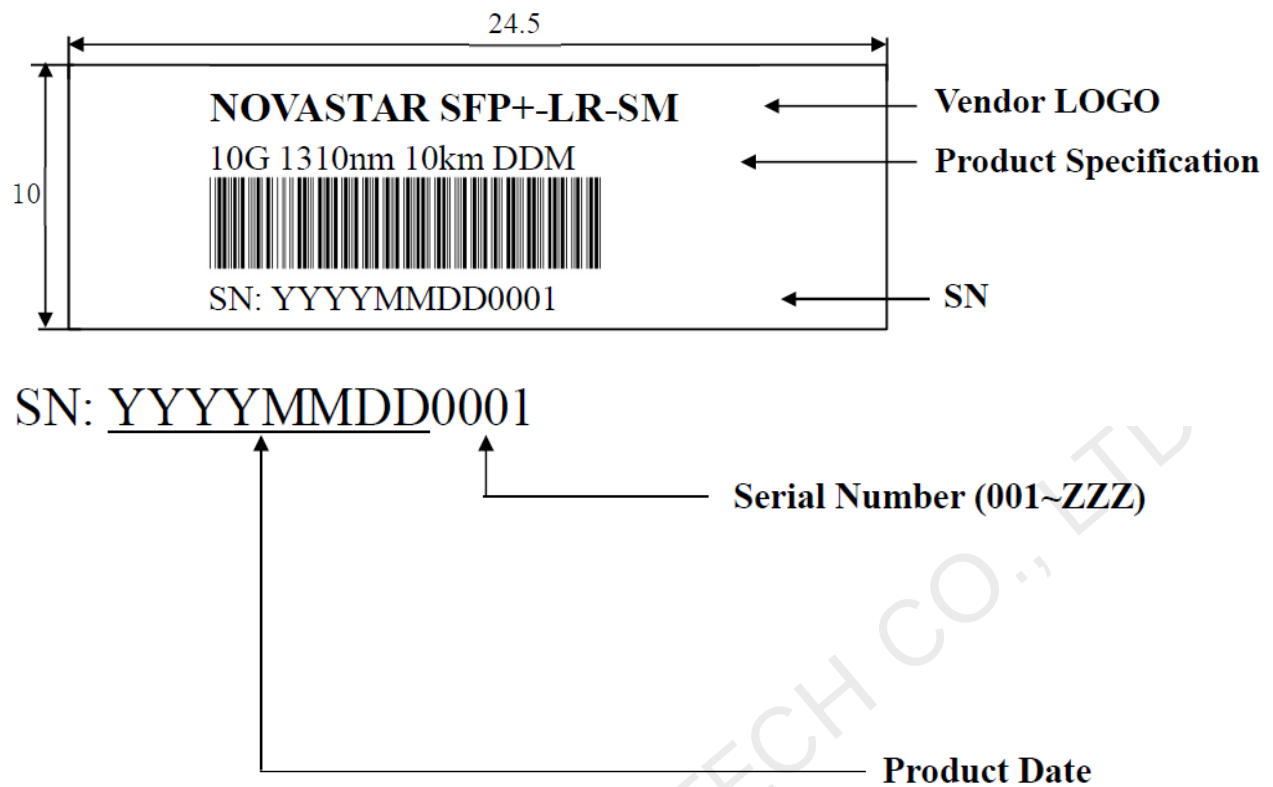
PIN	Symbol	Description	Ref.
1	Veet	Module Transmitter Ground	a)
2	TX_Fault	Module Transmitter Fault	b)
3	TX_Disable	Transmitter Disable, turns off the laser output	
4	SDA	2-wire Serial Interface Data Lane	
5	SCL	2-wire Serial Interface Clock	
6	Mod_ABS	Module Absent, connected To VeeT or VeeR in the module	
7	RS0	Rate Select 0, optionally controls SFP+ module Receiver	
8	RX_LOS	Receiver Loss of Signal Indication	
9	RS1	Rate Select 1, optionally controls SFP+ module transmitter	
10	VeeR	module receiver ground	a)
11	VeeR	module receiver ground	a)
12	RD-	Receiver inverted Data Output	
13	RD+	Receiver Non-inverted Data Output	
14	VeeR	Module Receiver ground	a)
15	VccR	Module Receiver 3.3V Supply	
16	VccT	Module Transmitter 3.3V Supply	
17	VeeT	Module Transmitter Ground	a)
18	TD+	Transmitter Non-inverted Data Input	
19	TD-	Transmitter Inverted Data Input	
20	VeeT	Module Transmitter Ground	a)

a) GND is the symbol for signal and supply (power) common for the module. All are common within the module and all module voltages are reference to this potential unless otherwise noted. Module circuit ground is isolated from module chassis ground within the module.

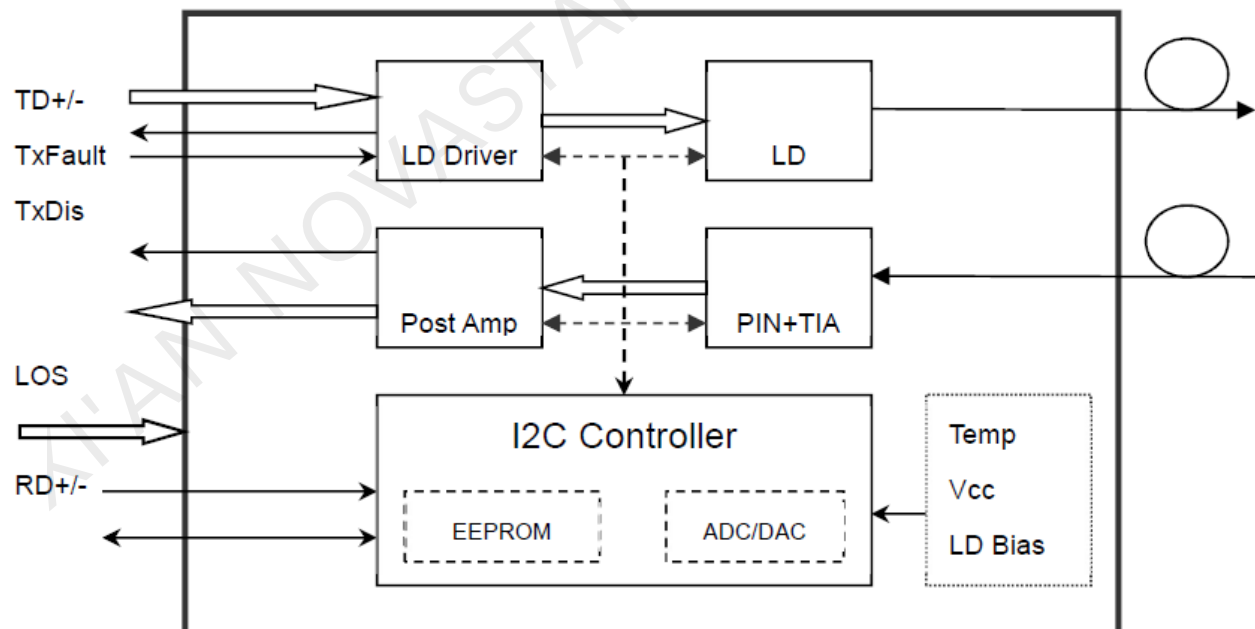
b) Open collector, should be pulled up with 4.7~10K ohms on the host board to a voltage between 3.15V and 3.6V



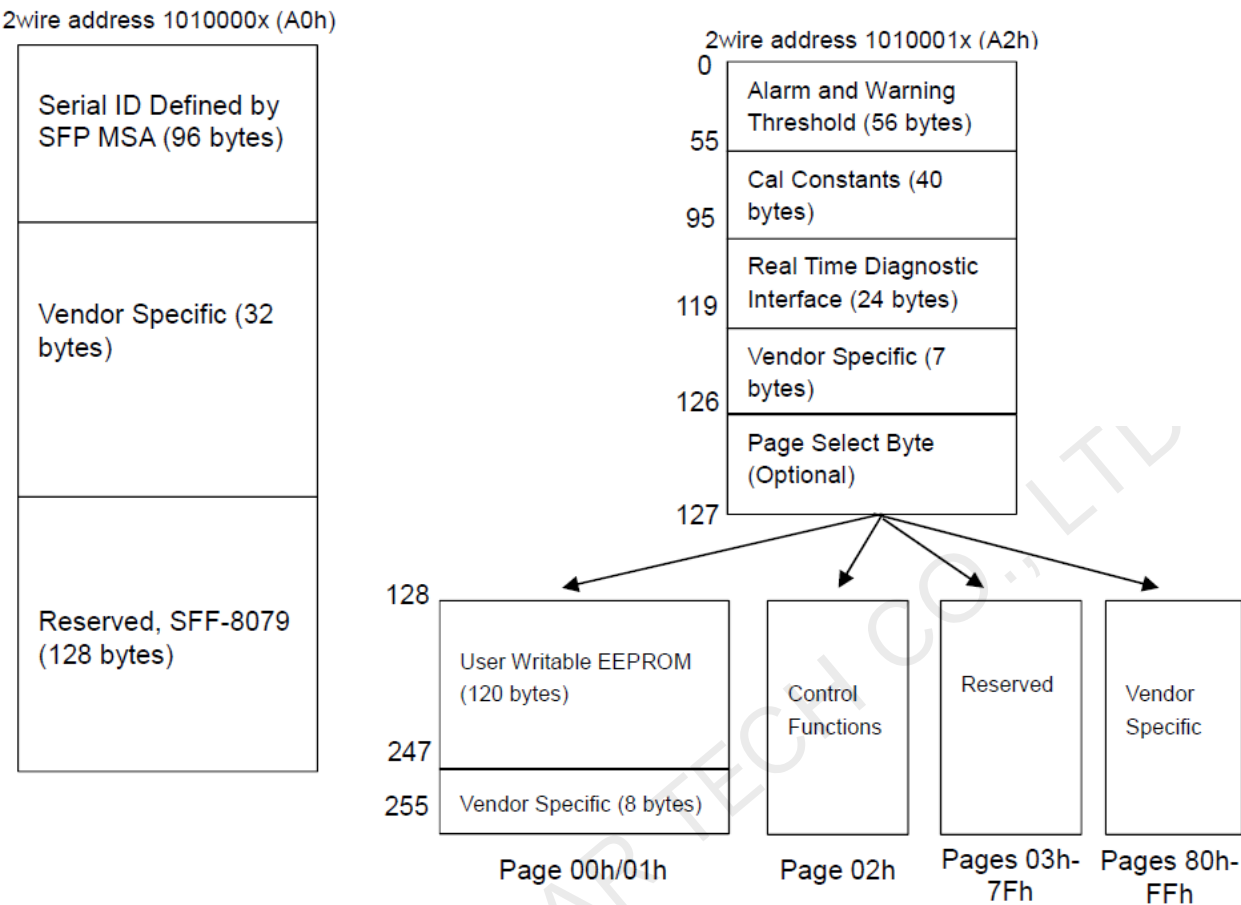
Module Label Diagram



Recommended Host Board Schematic



Memory Map (compliant SFF-8472)



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