

Features

- Supports 9.95 to 10.3Gbps bit rates
- Transmission distance up to 220m (OM1 fiber)
- Hot Pluggable SFP+ footprint
- 1310nm FP transmitter, PIN photo-detector
- Digital Status monitoring Interface
- Duplex LC connector
- RoHS compliant and Lead Free
- Metal enclosure for lower EMI
- Single 3.3V power supply
- Power dissipation < 1W
- Operating case temperature: 0 to 70°C
- Compliant with FC-PI-4 800-Mx-SN-I, SFF-8431 , SFF-8432 and SFF-8472



Applications

- 10GBASE-LRM 10G Ethernet
- Legacy FDDI multimode links

Description

This SFP+ LRM is an optical transceiver module for transmission at 1310nm over legacy multi mode fiber. Supporting 10GBASE-LRM Ethernet standard make it ideally suited for 10G datacom. It's very low power consumption and its excellent EMI performance allow system design with high port density. The small form factor integrates a 1310nm Fabry-Perot (FP) laser in an LC package and a linear multimode PIN receiver.

Absolute Maximum Ratings

<i>Parameter</i>	<i>Symbol</i>	<i>Min.</i>	<i>Typ.</i>	<i>Max.</i>	<i>Units</i>	<i>Note</i>
Storage Temperature	T_c	-40		85	°C	
Operating Case Temperature	T_c	0		70	°C	
Power Supply Voltage	V_{CC}	0		3.6	V	
Relative Humidity	RH	5		95	%	

Recommended Operating Environment

<i>Parameter</i>	<i>Symbol</i>	<i>Min.</i>	<i>Typ.</i>	<i>Max.</i>	<i>Units</i>	<i>Note</i>
Power Supply Voltage	V_{CC}	3.135	3.300	3.465	V	
Operating Case Temperature	T_c	0	25	70	°C	

Digital Diagnostic Functions

<i>Parameter</i>	<i>Symbol</i>	<i>Accuracy</i>	<i>Unit</i>	<i>Notes</i>
Temperature monitor absolute error	DMI_Temp	± 3	°C	
Supply voltage monitor absolute error	DMI_VCC	±0.08	V	
TX power	DMI_TX	± 3 dB	dB	
RX power	DMI_RX	± 3 dB	dB	
Bias Current monitor	DMI_Ibias	± 10%	mA	

Optical Characteristics

Parameter	Symbol	Min.	Typ.	Max	Units	Note
Transmitter						
Center Wavelength	λ_t	1260		1355	nm	
RMS spectral width	$\lambda_{rms} @1260nm$			2.4		
	$\lambda_{rms} @1260-1300nm$	-	-	2.4	nm	2
	$\lambda_{rms} @1300-1355nm$			4		
Average Optical Power	P_{avg}	-6.5	-	0.5	dBm	1
Extinction Ratio	ER	3.5	-	-	dB	
Optical Modulation Amplitude (OMA)	P_{OMA}	-4.5		1.5	dBm	
Peak Launch Power	P_{MAX}			3	dBm	
Transmitter Waveform Dispersion Penalty	$TWDP$			4.7	dB	3
Average Launch power of OFF transmitter	P_{OFF}			-30	dBm	
Uncorrelated Jitter [rms]	T_{xj}			0.033	UI	
Encircled Flux	$<5\mu m$	30			%	
	$<11\mu m$	81				
Transmitter Reflectance				-12	dB	
Optical Return Loss Tolerance		20			dB	
Relative Intensity Noise	R_{in}			-128	dB/Hz	
Receiver						
Comprehensive Stressed Receiver Sensitivity (OMA) @ 10.3125Gb/s	Precursor	-	-	-6.5	dBm	5
	Symmetrical			-6	dBm	
	Postcursor			-6.5	dBm	
LOS Assert	$LosA$	-30	-		dBm	
LOS De-assert	$LosD$			-11	dBm	
Overload	P_{MAX}	1.5	-		dBm	4
Receiver Reflectance		-	-	-12	dB	
LOS Hysteresis		0.5			dB	

Notes:

1. Average power figures are informative only, per IEEE802.3aq
2. Maximum RMS spectral width as specified by Figure 3
3. Optical Eye Mask requires the host board to be SFF-8431 compliant. Optical eye mask per IEEE802.3aq.
4. TWDP figure requires the host board to be SFF-8431 compliant. TWDP is calculated using the Matlab code provided in clause 68.6.6.2 of IEEE802.3aq
5. Receiver overload specified in OMA and under the worst comprehensive stressed condition.
6. Conditions of stressed receiver tests per IEEE802.3aq. CSRS testing requires the host board to be SFF-8431 compliant.

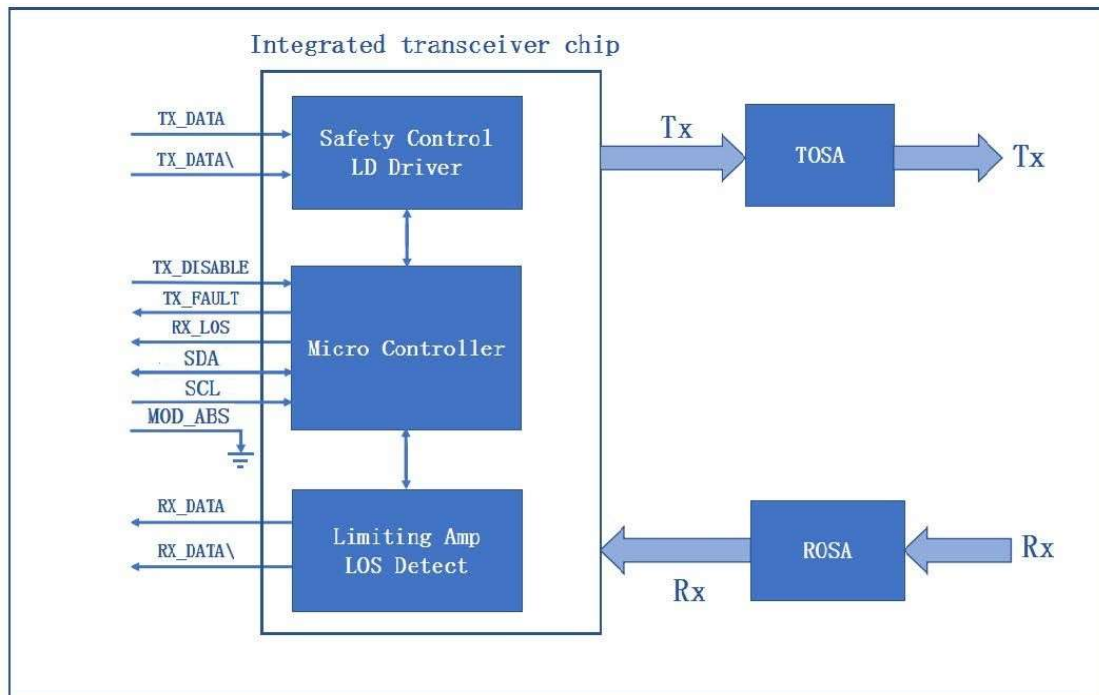
Electro Characteristics

Parameter	Symbol	Min.	Typ	Max	Unit	Notes
Nominal Data Rate	VID		10.3125		Gbps	
Supply Voltage	Vcc	3.14		3.46	V	
Supply Current	Icc		200	300	mA	
Power Dissipation	P			1	W	
Transmitter						
Input differential impedance	Rin		100		Ω	2
Single ended data input swing	Vin,pp	90		350	mV	3
Transmit Disable Voltage	VD	2		Vcc	V	4
Transmit Enable Voltage	VEN	Vee		Vee+ 0.8	V	
Receiver						
Termination Mismatch at 1 MHz	ΔZM			5	%	
Single Ended Output Voltage Tolerance		-0.3		4	V	
Output AC Common Mode Voltage				7.5	mV RMS	
Output Rise and Fall time (20% to 80%)	Tr, Tf	30			Ps	5
Relative Noise LRM Links with crosstalk	dRNx			TBD equation	dB/Hz	6
Difference Waveform Distortion Penalty	dWDP		per SFF-8431		dB	7
Differential Voltage Modulation Amplitude	VMA	180		600	mV	
LOS Fault	VLOS fault	2		VccHOST	V	8
LOS Normal	VLOS norm	Vee		Vee+ 0.8	V	8
Power Supply Noise Tolerance	VccT/VccR		per SFF-8431		mVpp	

Notes:

1. Non-condensing.
2. Connected directly to TX data input pins. AC coupling from pins into laser driver IC.
3. Per SFF-8431 Rev 3.0
4. Into 100 ohms differential termination.
5. Measured with Module Compliance Test Board and OMA test pattern.
6. Crosstalk source rise/fall time (20%-80%) is 35 ps.
7. Defined with reference receiver with 14 T/2 spaced FFE taps and 5 T spaced DFE taps.
8. LOS is an open collector output. Should be pulled up with 4.7k – 10kΩ on the host board. Normal operation is logic 0; loss of signal is logic 1. Maximum pull-up voltage is 5.5V.
9. As described in Section 2.8.1, SFF-8431 Rev 3.0.

Block Diagram of Transceiver



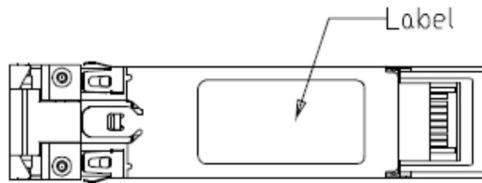
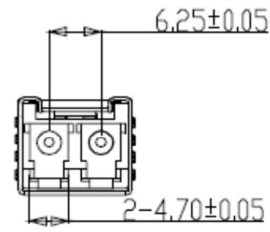
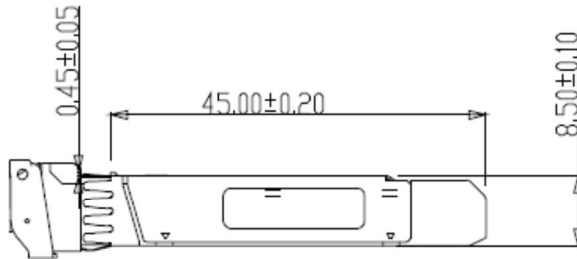
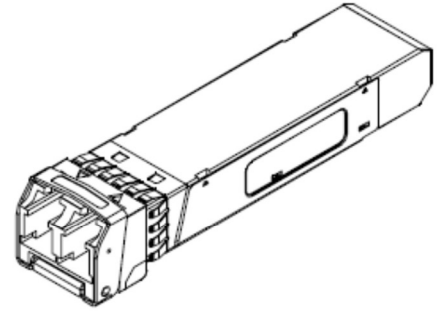
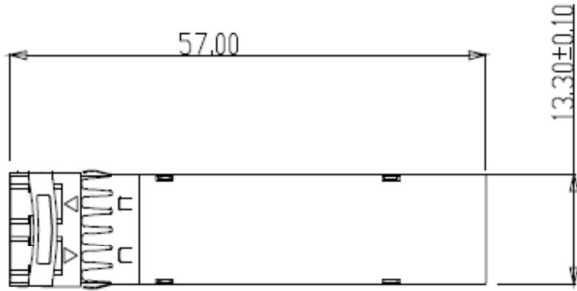
Pin Assignment

<i>Pin</i>	<i>Symbol</i>	<i>Function/Description</i>	<i>Note</i>
1	VEET	Transmitter Ground	1
2	Tx_FAULT	Transmitter Fault	2
3	Tx_DIS	Transmitter Disable. Laser output disabled on high or open	3
4	SDA	2-wire Serial Interface Data Line	2
5	SCL	2-wire Serial Interface Clock Line	2
6	MOD_ABS	Module Absent. Grounded within the module	4
7	RS0	Rate Select 0	5
8	RX_LOS	Loss of Signal indication. Logic 0 indicates normal operation	2
9	RS1	Rate Select 1	5
10	VEER	Receiver Ground	1
11	VEER	Receiver Ground	1
12	RD-	Receiver Inverted DATA out. AC Coupled	
13	RD+	Receiver DATA out. AC Coupled	
14	VEER	Receiver Ground	1
15	VCCR	Receiver Power Supply	
16	VCCT	Transmitter Power Supply	
17	VEET	Transmitter Ground	1
18	TD+	Transmitter DATA in. AC Coupled	
19	TD-	Transmitter Inverted DATA in. AC Coupled	
20	VEET	Transmitter Ground	1

Notes:

- Module circuit ground is isolated from module chassis ground within the module.
- Should be pulled up with 4.7k – 10k ohms on host board to a voltage between 3.15V and 3.6V.
- Tx_Disable is an input contact with a 4.7 kΩ to 10 kΩ pullup to VccT inside the module.
- Mod_ABS is connected to VeeT or VeeR in the SFP+ module. The host may pull this contact up to Vcc_Host with a resistor in the range 4.7 kΩ to 10 kΩ. Mod_ABS is asserted “High” when the SFP+ module is physically absent from a host slot.
- RS0 and RS1 are module inputs and are pulled low to VeeT with > 30 kΩ resistors in the module.

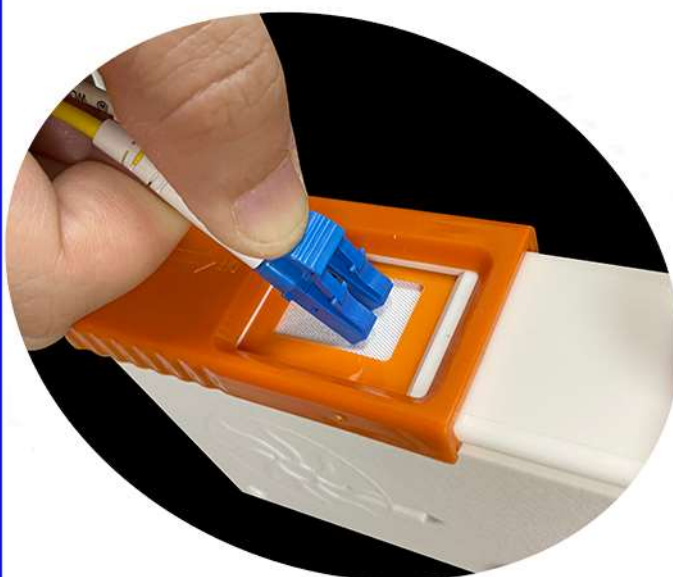
Dimensions



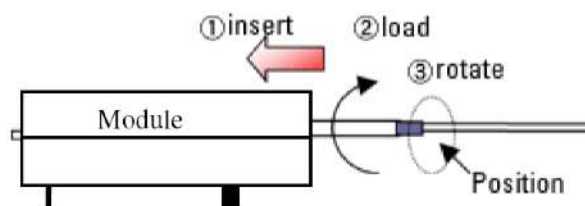
Optical Receptacle Cleaning Recommendations :

All fiber stubs inside the receptacle portions were cleaned before shipment. In the event of contamination of the optical ports, the recommended cleaning process is the use of forced nitrogen. If contamination is thought to have remained, the optical ports can be cleaned using a NTT international Cletop® stick type and HFE7100 cleaning fluid. Before the mating of patch-cord, the fiber end should be cleaned up by using Cletop® cleaning cassette.

Cleaning of patch-cord



Cleaning of fiber stub



1. Insert
Ensure that stick is held straight when inserting into sleeve.
2. Load
Apply sufficient pressure (approx 600-700g) to ensure ferrule a little depressed in sleeve.
3. Rotate
Rotate stick clockwise 4-5 times, while ensuring direct contact with ferrule end-face is maintained.

*Notice: Number of possible wipes:
Maintenance (repair) ~1 use / piece
Equipment construction: 4 uses / piece (max.)*

Note: The pictures were extracted from NTT-ME website. And the Cletop® is a trademark registered by NTT-ME

Ordering Information

<i>Model Number</i>	<i>Part Number</i>	<i>Wavelength</i>	<i>Temperature</i>
SFP-10G-LRM	OPAK-MX2-13-CF	1310nm	0 to 70 °C

Modification History

<i>Revision</i>	<i>Date</i>	<i>Description</i>
A1	July, 2009	Initial Release
A2	July 2013	Revised

Note: All information contained in this document is subject to change without notice.