TRXNFEMM

Fast Ethernet SFP Multimode Transceivers

Features

- ☑ *Lead Free Design & Fully RoHS Compliant*
- ☑ *Compatible with SFP MSA*
- ☑ *Designed for Fast Ethernet 100BASE-FX Applications*
- ☑ *1310nm LED Transmitter*
- ☑ *Hot-pluggable*
- ☑ *Excellent EMI & ESD Protection*
- ☑ *Loss of Signal Output*
- ☑ *Distances up to 2km*
- ☑ *TX Disable Input*
- ☑ *Duplex LC Optical Interface*
- ☑ *Single +3.3V Power Supply*

Description

The TRXNFEMM series of fiber optic transceivers provide a quick and reliable interface for 100BASE-FX Fast Ethernet multimode applications.

The transceivers connect to standard 20-pad SFP connectors for hot plug capability. This allows the system designer to make configuration changes or maintenance by simply plugging in different types of transceivers without removing the power supply from the host system.

The transceivers have bail-type latches, which offer an easy and convenient way to release the modules. The latch is compliant with the SFP MSA.

The transmitter design incorporates a highly reliable 1310nm LED and a driver circuit. The receiver features a low noise transimpedance amplifier IC for high sensitivity and wide dynamic range. The transmitter and receiver DATA interfaces are AC-coupled internally. LV-TTL Transmitter Disable control input and Loss of Signal output interfaces are also provided.

The transceivers operate from a single +3.3V power supply over three operating case temperature ranges of -5°C to +70°C (“B” option), -5°C to +85°C (“E” option) or -40°C to +85°C (“A” option). The housing is made of plastic and metal for EMI immunity.

Absolute Maximum Ratings

Parameter		Symbol	Minimum	Maximum	Units
Storage Temperature		T_{st}	- 40	+ 85	°C
Operating Case Temperature[1]	"B" option	T_{op}	- 5	+ 70	°C
	"E" option		- 5	+ 85	
	"A" option		- 40	+ 85	
Supply Voltage		V_{CC}	0	+ 5.0	V
Input Voltage		V_{in}	0	V_{CC}	V
Lead Terminal Finish, Reflow Profile Limits and MSL		-	-	NA	-

[1]Measured on top side of SFP module at the front center vent hole of the cage.

Transmitter Performance Characteristics (over Operating Case Temperature, V_{CC} = 3.13 to 3.47V)

All parameters guaranteed only at typical data rate

Parameter	Symbol	Minimum	Typical	Maximum	Units
Operating Data Rate[1]	B	-	125	-	Mb/s
Optical Output Power[2]	P_o	- 19.0	- 16.0	- 14.0	dBm
Center Wavelength[3]	λ_c	1270	-	1380	nm
Spectral Width (FWHM)[3]	$\Delta\lambda_{FWHM}$	-	140	-	nm
Optical Rise/Fall Time (10% to 90%)[3]	t_r, t_f	0.6	-	3.0	ns
Extinction Ratio	P_{hi}/P_{lo}	10	-	-	dB
Optical Output Power of OFF Transmitter	P_{OFF}	-	-	- 45.0	dBm
Duty Cycle Distortion Jitter (peak-to-peak)	DCD	-	-	1.0	ns
Data Dependent Jitter (peak-to-peak)	DDJ	-	-	0.6	ns
Random Jitter (peak-to-peak)[4]	RJ	-	-	0.76	ns
Transmitter Output Eye[5]	Typically compliant with OC-3/STM-1 eye mask (GR-253-CORE and G. 957) without filter, but not guaranteed and not tested for.				

[1]Data rate ranges from 50Mb/s to 266Mb/s. However, some degradation may be incurred in overall performance.
[2]Measured average power coupled into 62.5/125μm, 0.275 NA graded-index multimode fiber. The minimum power specified is at Beginning-of-Life.
[3]The Center Wavelength, Spectral Width and Optical Rise/Fall Time satisfy the trade-off curves in FDDI PMD document as shown in Figure 1.
[4]Defined as 12.6 times the rms value per FDDI PMD.
[5]Compliance with the Optical Pulse Envelope in FDDI PMD is not specified and is not claimed.

Receiver Performance Characteristics (over Operating Case Temperature, V_{CC} = 3.13 to 3.47V)

All parameters guaranteed only at typical data rate

Parameter		Symbol	Minimum	Typical	Maximum	Units
Operating Data Rate[1]		B	-	125	-	Mb/s
Minimum Input Optical Power (2.5 x 10^{-10} BER)[2]		P_{min}	- 32.5	- 34.5	-	dBm
Maximum Input Optical Power (2.5 x 10^{-10} BER)[2]		P_{max}	- 14.0	0	-	dBm
LOS Thresholds	Increasing Light Input	P_{los+}	P_{los-} + 1.5dB	-	- 32.5	dBm
	Decreasing Light Input	P_{los-}	- 45.0	-	-	
LOS Hysteresis		-	1.5	-	-	dB
LOS Timing Delay	Increasing Light Input	t_loss_off	-	-	100	μs
	Decreasing Light Input	t_loss_on	-	-	350	
Contributed Duty Cycle Distortion Jitter (peak-to-peak)		DCD	-	-	0.4	ns
Contributed Data Dependent Jitter (peak-to-peak)		DDJ	-	-	1.0	ns
Contributed Random Jitter (peak-to-peak)[3]		RJ	-	-	2.14	ns
Wavelength of Operation		λ	1100	-	1600	nm

[1]Data rate ranges from 50Mb/s to 266Mb/s. However, some degradation may be incurred in overall performance.
[2]Specified in average optical input power and measured with 2^{23}-1 PRBS at 125Mb/s and 1310nm wavelength with optical input rise/fall time of 2.5ns and optimum sampling.
[3]Defined as 12.6 times the rms value per FDDI PMD.

Transmitter Electrical Interface (over Operating Case Temperature, V_{CC} = 3.13 to 3.47V)

Parameter	Symbol	Minimum	Typical	Maximum	Units
Input Voltage Swing (TD+ & TD-)[1]	$V_{PP\text{-}DIF}$	0.50	-	2.4	V
Input HIGH Voltage (TX Disable)[2]	V_{IH}	2.0	-	V_{CC}	V
Input LOW Voltage (TX Disable)[2]	V_{IL}	0	-	0.8	V

[1]Differential peak-to-peak voltage.
[2]There is an internal 4.7 to 10kΩ pull-up resistor to *VccT*.

Receiver Electrical Interface (over Operating Case Temperature, V_{CC} = 3.13 to 3.47V)

Parameter	Symbol	Minimum	Typical	Maximum	Units
Output Voltage Swing (RD+ & RD-)[1]	$V_{PP\text{-}DIF}$	0.6	-	2.0	V
Output HIGH Voltage (LOS)[2]	V_{OH}	2.0	-	V_{CC} + 0.3	V
Output LOW Voltage (LOS)[2]	V_{OL}	0	-	0.5	V

[1]Differential peak-to-peak voltage across external 100Ω load.
[2]Open collector compatible, 4.7 to 10kΩ pull-up resistor to *Vcc* (Host Supply Voltage).

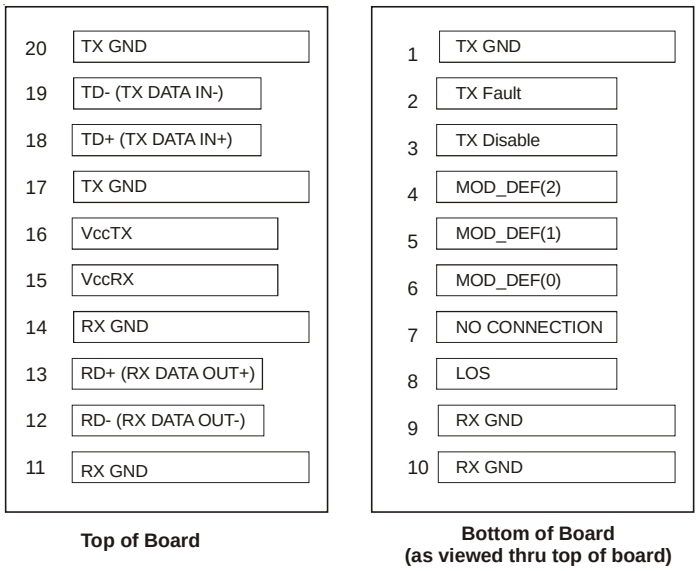
Electrical Power Supply Characteristics (over Operating Case Temperature, V_{CC} = 3.13 to 3.47V)

Parameter	Symbol	Minimum	Typical	Maximum	Units
Supply Voltage	*Vcc*	3.13	3.3	3.47	V
Supply Current	*Icc*	-	222	245	mA

Module Definition

MOD_DEF(0) pin 6	MOD_DEF(1) pin 5	MOD_DEF(2) pin 4	Interpretation by Host
TTL LOW	SCL	SDA	Serial module definition protocol

Electrical Pad Layout

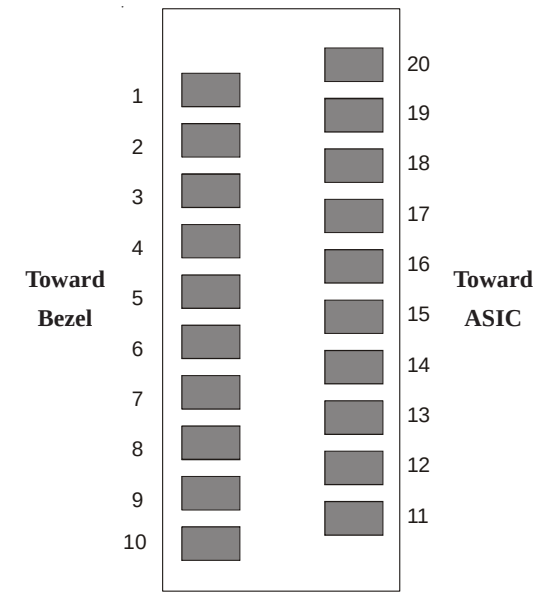


Top of Board

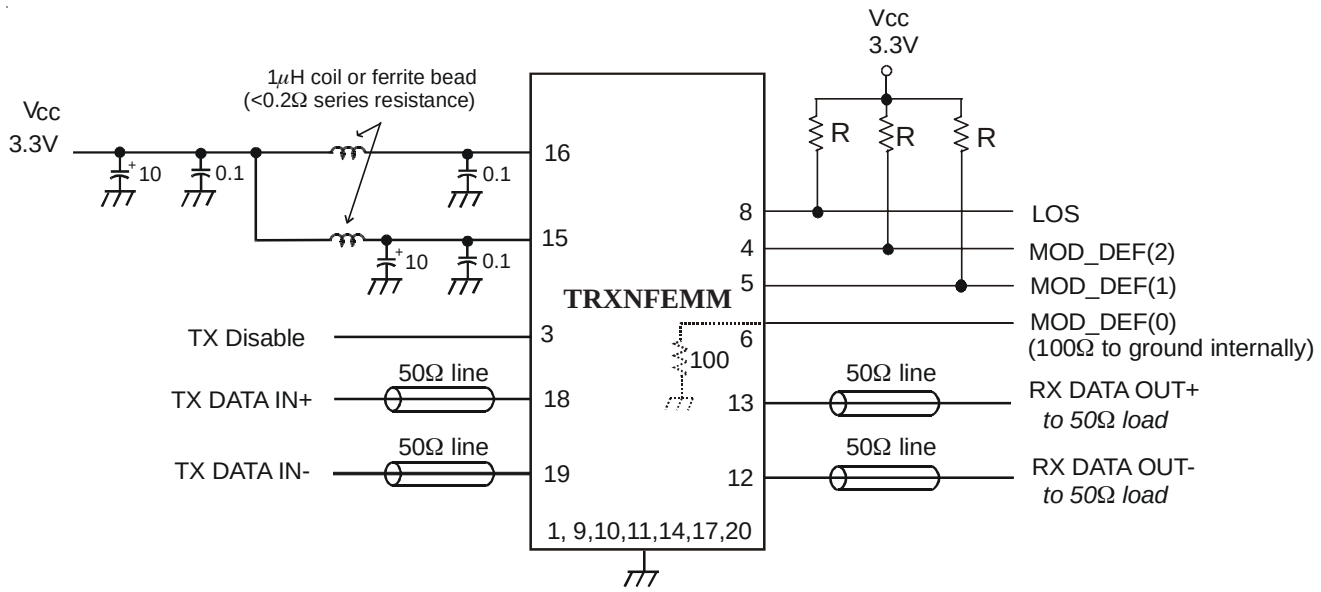
Bottom of Board (as viewed thru top of board)

Pin 2 Internally Grounded.

Host Board Connector Pad Layout



Example of SFP host board schematic



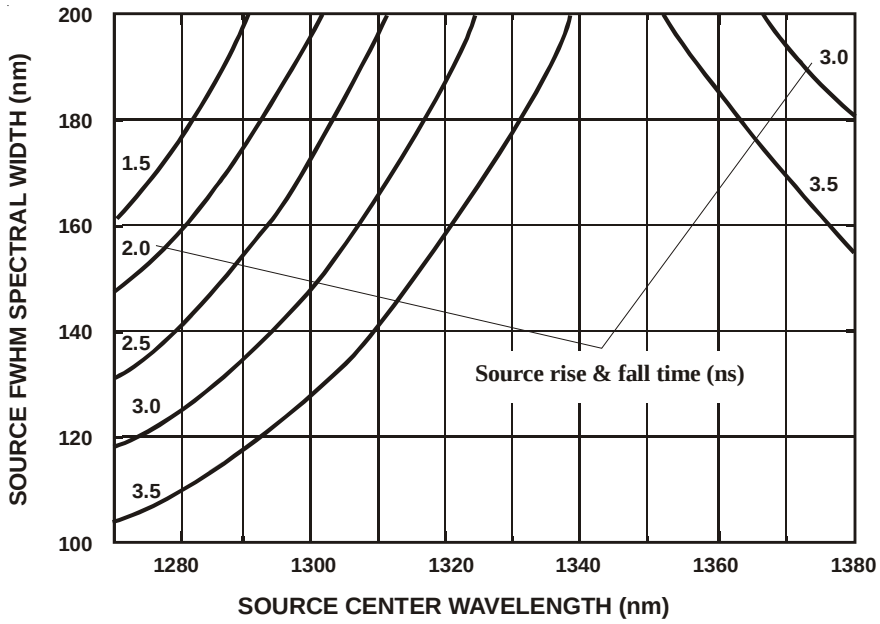


Figure 1 - Trade-off curves in FDDI PMD document

Application Notes

Electrical interface: All signal interfaces are compliant with the SFP MSA specification. The high speed DATA interface is differential AC-coupled internally and can be directly connected to a 3.3V SERDES IC. All low speed control and sense output signals are open collector TTL compatible and should be pulled up with a 4.7 - 10kΩ resistor on the host board.

Loss of Signal (LOS): The Loss of Signal circuit monitors the level of the incoming optical signal and generates a logic HIGH when an insufficient photocurrent is produced.

TX Fault: Per SFP MSA, pin 2 is TX Fault. This transceiver is LED based and does not support TX Fault. Pin 2 is internally connected to transmitter circuit ground (TX GND) to indicate normal operation.

TX Disable: When the TX Disable pin is at logic HIGH, the transmitter optical output is disabled (less than -45dBm).

Serial Identification: The module definition of SFP is indicated by the three module definition pins, MOD_DEF(0), MOD_DEF(1) and MOD_DEF(2). Upon power up, MOD_DEF(1:2) appear as NC (no connection),

Application Notes (Cont.)

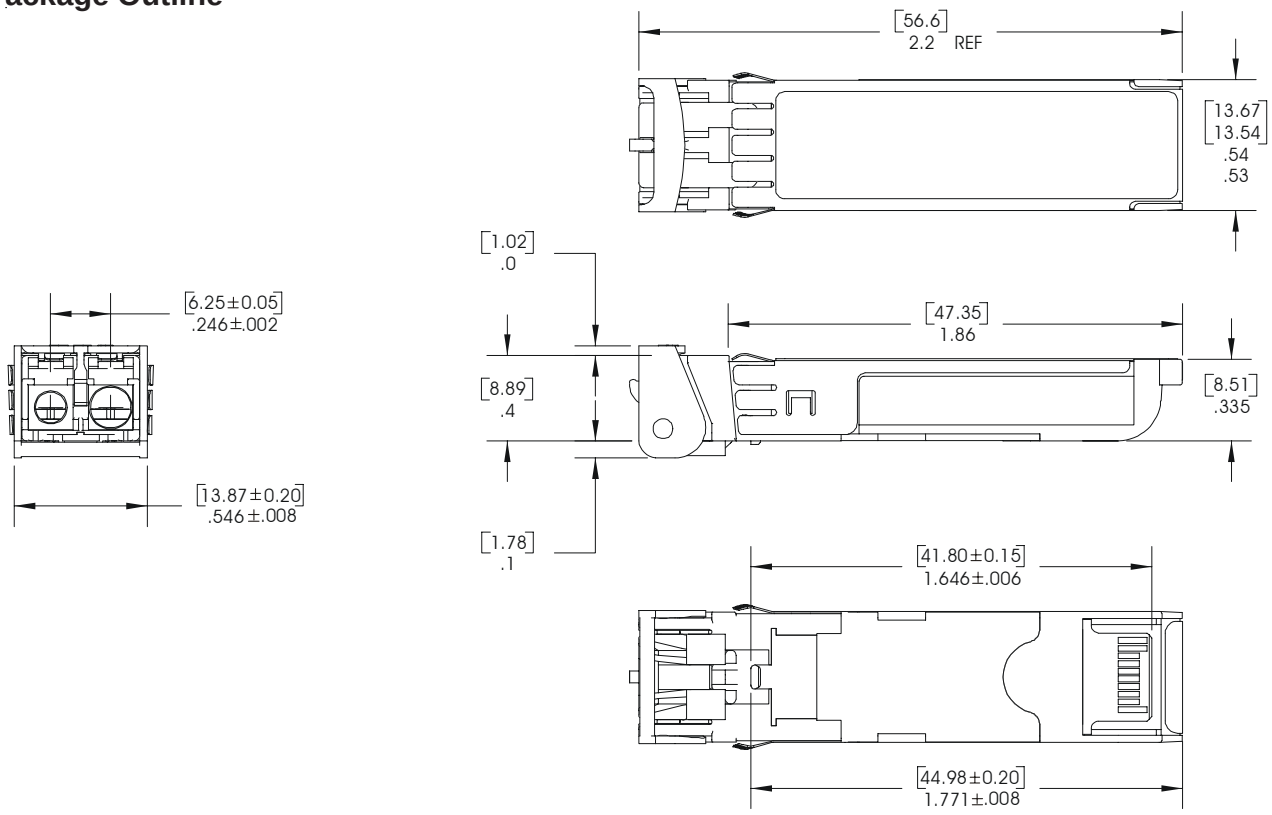
and MOD_DEF(0) is TTL LOW. When the host system detects this condition, it activates the serial protocol (standard two-wire I^2C serial interface) and generates the serial clock signal (SCL). The negative edge clocks data from the SFP EEPROM.

The serial data signal (SDA) is for serial data transfer. The host uses SDA in conjunction with SCL to mark the start and end of serial protocol activation.

The data transfer protocol and the details of the mandatory and vendor specific data structures are defined in the SFP MSA.

Power supply and grounding: The power supply line should be well-filtered. All 0.1μF power supply bypass capacitors should be as close to the transceiver module as possible.

Package Outline



Dimensions in inches [mm]
Default tolerances:
.xxx = ± .005", .xx = ± .01"

Ordering Information

Model Name	Operating Case Temperature	Latch Color	Nominal Wavelength
TRXNFEMM4BSS	- 5°C to +70°C	Silver	1310nm
TRXNFEMM4ESS	- 5°C to +85°C	Silver	1310nm
TRXNFEMM4ASS	- 40°C to +85°C	Silver	1310nm

Optical Communication Products, Inc.
6101 Variel Avenue, Woodland Hills, CA 91367, Tel.: 818-251-7100, FAX: 818-251-7111, www.ocp-inc.com

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