1.25G SFP 1310nm Transceiver

TVASFPSM-X

Features

- Compliant with IEEE Std 802.3-2005, Gigabit Ethernet 1000Base-LX
- Compliant with SFF-8074i andSFF-8472
- Compliant with SFP MSA Specification
- Digital Diagnostic Monitoring available
- Uncooled 1310nm Fabry-Perot (FP) Laser
- Up to 1.25Gb/s bi-directional data links
- Up to 20km on 9/125μm SMF
- Duplex LC connector compliant
- Single +3.3V DC power supply
- Hot-pluggable SFP footprint
- Class 1 laser safety certified
- Low power dissipation
- Operating temperature options：-40 ~ +85°C
- RoHS compliance

Applications

- Gigabit Ethernet 1000Base-LX
- 1.0625Gb/s Fiber Channel
- Enterprise Router
- Switch to Switch Interface
- Other Optical Links

Description

TVASFPSM-X is a high performance, cost effective module, which is optimized for 1000BASE-LX, and transmission distance up to 20km on SMF. The transceiver consists of two sections:

The transmitter section incorporates an 1310nm FP driver.

The receiver section consists of a PIN photodiode integrated with a transimpedance preamplifier (TIA).

The module is hot pluggable into the 20-pin connector.

The high-speed electrical interface is based on low voltage logic, with nominal 100 Ohms differential impedance and AC coupled in the module. The optical output can be disabled by LVTTL logic high-level input of TX_DIS. 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.

Ordering Information

Part No.	Specification								
	Pack	Rate	Tx	Pout	Rx	Sen	Temp	Reach	Others
TVASFPSM-1	SFP	1.25G	1310nm FP	-9 ~ -3dBm	PIN	<-18dBm	-40 ~ 85℃	10km	DDM/RoHS
TVASFPSM-2	SFP	1.25G	1310nm FP	-9 ~ -3dBm	PIN	<-23dBm	-40 ~ 85℃	20km	DDM/RoHS

Specification

Absolute Maximum Ratings

Parameter	Symbol	Min.	Max.	Unit
Storage Temperature	T_S	-40	+85	℃
Supply Voltage	V_{CC3}	3.1	3.6	V
Relative Humidity(Non-condensing)	RH	5	85	%
RX Input Average Power	Pmax	-	-3	dBm

Recommended Operating Conditions

Parameter	Symbol	Min.	Typical	Max.	Unit
Temperature	T_C	-40		85	℃
Power Supply Voltage	V_{CC3}	3.135	3.3	3.465	V
	I_{CC3}	–	–	300	mA
Power Dissipation	P_D	–	–	1	W
Data Rate	–	0.1		1.25	Gbps
Transmission Distance	–	–	–	10、20	km

Transmitter Operating Characteristic: Optical, Electrical

Parameter		Symbol	Min.	Typical	Max.	Unit	Note
Center Wavelength		λ_C	1260	1310	1360	nm	
Laser Off Power		Poff	-	-	-30	dBm	
Average Optical Power		Pavg	-9	-	-3	dBm	
RMS spectral width		–	–	–	4	nm	
Extinction Ratio		ER	9	-	-	dB	
Optical Eye Diagram		IEEE Std 802.3-2005 Gigabit Ethernet 1000Base-LX compatible					
Tx Input Diff Swing		VI	300	–	2200	mV	
Tx_Disable	Disable	–	2	–	VCC	V	
	Enable	–	VEE	–	VEE+ 0.8	V	

Transmitter Operating Characteristic: Optical, Electrical

Parameter	Symbol	Min.	Typical	Max.	Unit	Note
Center Wavelength	λ_C	1260	1310	1360	nm	Note1
Laser Off Power	Poff	-	-	-30	dBm	
Average Optical Power	Pavg	-9	-	-3	dBm	
RMS spectral width	-	-	-	4	nm	
Extinction Ratio	ER	9	-	-	dB	
Transmitter Dispersion Penalty	TDP	-	-	1	dB	
Operating Data Rate		-	1.25/ 1.0625	-	Gbps	
Optical Eye Mask Margin	-	10	-	-	%	
Tx Input Diff Swing	VI	300	-	2200	mV	

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Tx_Disable	Disable	-	2	-	VCC	V	
	Enable	-	VEE	-	VEE+ 0.8	V	

Receiver Operating Characteristic: Optical, Electrical

Parameter	Symbol	Min.	Typ.	Max.	Unit	Note
Center Wavelength	λr	1260	1310	1360	nm	
Receiver Sensitivity (OMA)	–	–	–	-18	dBm	10km,Note1
Receiver Sensitivity (OMA)	–	–	–	-23	dBm	20km,Note1
LOS Assert	LOS A	-35	–	–	dBm	
LOS Dessert	LOS D	–	–	-19	dBm	10km
LOS Dessert	LOS D	–	–	-24	dBm	20km
LOS Hysteresis	LOSH	0.5	–	6	dB	
Overload	Pin	-3	–	–	dBm	
Return Loss of Receiver	–	12	–	–	dB	
Rx Output Diff Swing	Vo	500	–	1200	mV	

Note1:Measured at all data rates specified in data rate table with ER=9 dB,2^7-1 PRBS data pattern,BER<1E-12

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	–	1	ms	Note4
Tx_Fault Reset	t_reset	10	–	µs	Note5
LOS Assert Time	t_loss_on	–	100	µs	Note6
LOS Deassert Time	t_loss_off	–	100	µs	Note7
Serial ID Clock Rate	f_serial_clock	100	400	kHz	Note8

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 TX Disable must be held high to reset TX_fault

[6] Time from LOS state to RX LOS assert

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

[8] Time from rising or falling edge of Rate Select input until receiver bandwidth is in conformance with appropriate specification

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Pin-out Definition
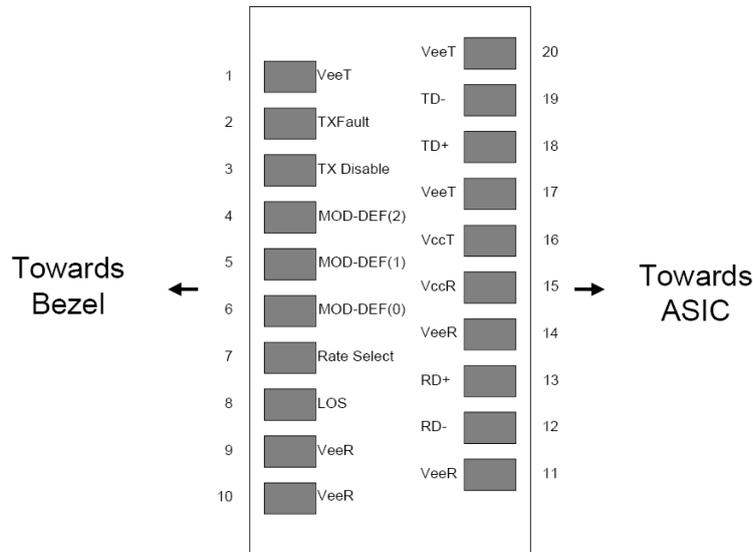
Pin Assignment

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	RS	Rate Select, optionally controls SFP module receiver. When High input data rate 10.3GBd and when LOW input data rate 1.25GBd.	Note6
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		VeeR	Module Receiver Ground	Note1
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

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NOTE：

Plug Seq: Pin engagement sequence during hot plugging.

[1]TX Fault is an open collector/drain output, which should be pulled up with a 4.7K – 10KÙ resistor on the host board. Pull up voltage between 2.0V and VccT, R+0.3V. When high, 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 is an input that is used to shut down the transmitter optical output. It is pulled up within the module with a 4.7 – 10 KΩ resistor. Its statesare:

Low (0 – 0.8V): Transmitter on

(>0.8, < 2.0V): Undefined

High (2.0 – 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 (see Section IV for further details).

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]This is an optional input used to control the receiver bandwidth for compatibility with multiple data rates (most likely Fibre Channel 1x and 2x Rates). If implemented, the input will be internally pulled down with > 30kΩ resistor. The input states are:

Low (0 – 0.8V): Reduced Bandwidth

High (2.0 – Vcc): Full Bandwidth

[5]LOS (Loss of Signal) is an open collector/drain output, which should be pulled up with a 4.7K – 10KΩ resistor. Pull up voltage between 2.0V and VccT, R+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.

[6]VeeR and VeeT may be internally connected within the SFP module.

Block Diagram of Transceiver
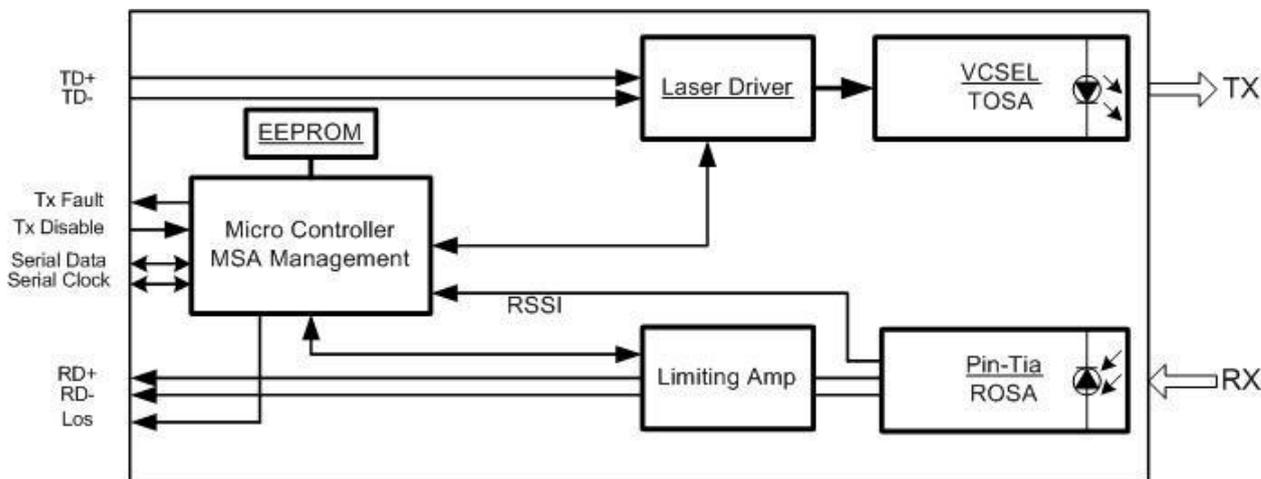
Transmitter Section

The transmitter converts 1.25Gbit/s serial PECL or CML electrical data into serial optical data compliant with the 10GBASE-SR standard. An open collector compatible Transmit Disable (Tx_Dis) is provided. A logic "1," or no connection on this pin will disable the laser from transmitting. A logic "0" on this pin provides normal operation. The transmitter has an internal automatic power control loop (APC) to ensure constant optical power output across supply voltage and temperature variations. An open collector compatible Transmit Fault (Tx_Fault) is provided. TX_Fault is a module output contact that when high, indicates that the module transmitter has detected a fault condition related to laser operation or safety. The TX_Fault output contact is an open drain/collector and shall be pulled up to the Vcc_Host in the host with a resistor in the range 4.7-10 kΩ. TX_Disable is a module input contact. When TX_Disable is asserted high or left open, the SFP module transmitter output shall be turned off. This contact shall be pulled up to VccT with a 4.7 kΩ to 10 kΩ resistor.

Receiver Section

The receiver converts 1.25Gbit/s serial optical data into serial PECL/CML electrical data. An open collector compatible Loss of Signal is provided. Rx_LOS when high indicates an optical signal level below that specified in the relevant standard. The Rx_LOS contact is an open drain/collector output and shall be pulled up to Vcc_Host in the host with a resistor in the range 4.7-10 kΩ, or with an active termination. Power supply filtering is recommended for both the transmitter and receiver. The Rx_LOS signal is intended as a preliminary indication to the system in which the SFP is installed that the received signal strength is below the specified range. Such an indication typically points to non-installed cables, broken cables, or a disabled, failing or a powered off transmitter at the far end of the cable.

Recommended Interface Circuit
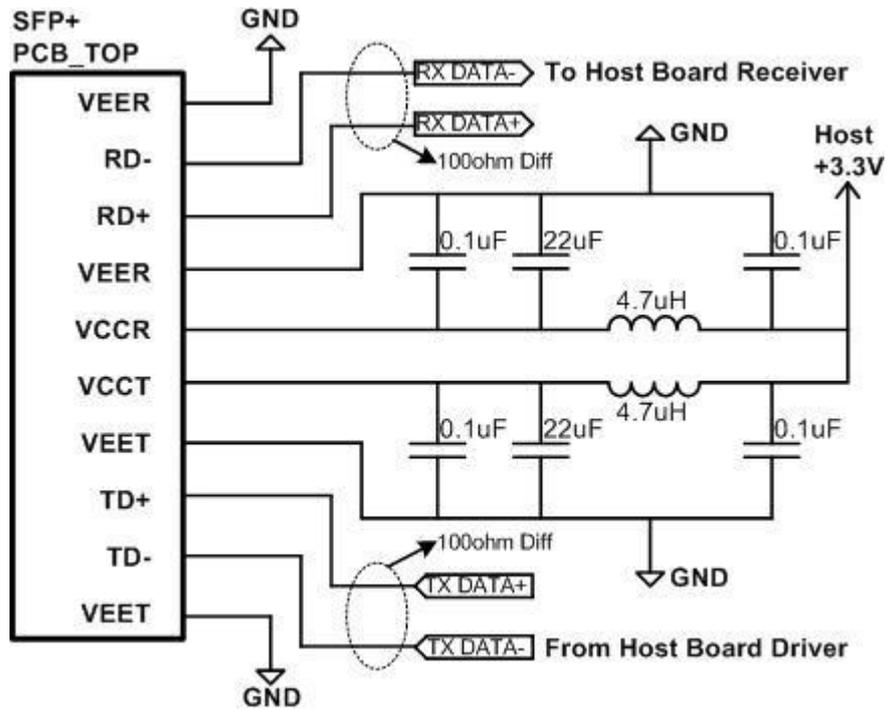
Mechanical specifications

Unit: mm
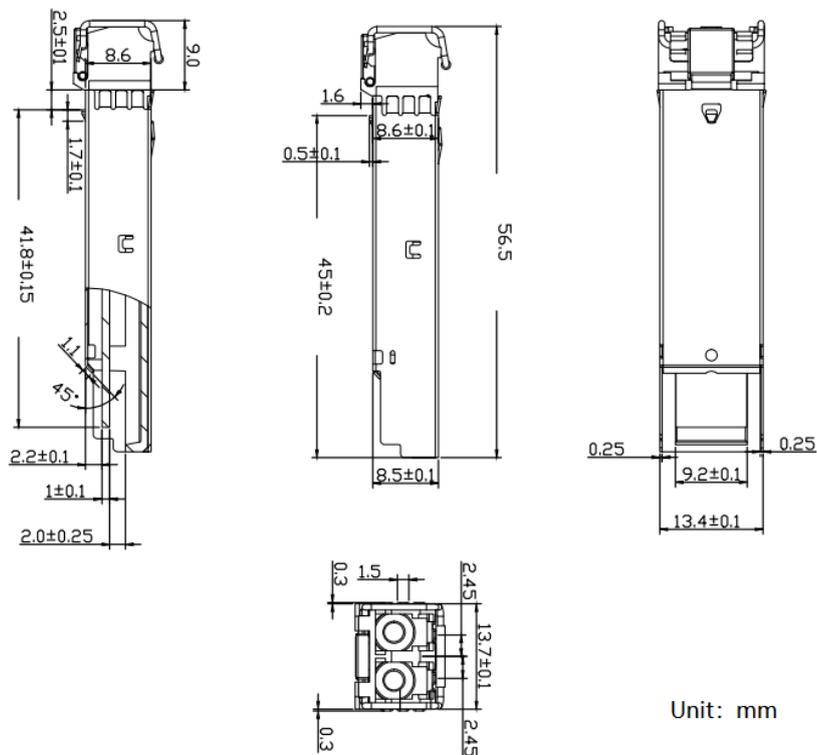
Digital Diagnostic Memory Map

2 wire address 1010000X (A0h)

```
0
     Serial ID Defined by
     SFP MSA (96 bytes)
95
     Vendor Specific
     (32 bytes)
127
     Reserved in SFP
     MSA (128 bytes)
255
```

2 wire address 1010001X (A2h)

```
0
     Alarm and Warning
     Thresholds (56 bytes)
55
     Cal Constants
     (40 bytes)
95
     Real Time Diagnostic
     Interface (24 bytes)
119
     Vendor Specific (8 bytes)
127
     User Writable
     EEPROM (120 bytes)
247
     Vendor Specific (8 bytes)
255
```

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