



T1-SFP-10G-LR Optical Transceiver Datasheet

Overview

T1Nexus T1-SFP-10G-LR is a high performance, cost effective module supporting a data rate of 11.3Gbps and 10km transmission distance with SMF.

The transceiver consists of three sections: a DFB 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 and SFF-8472 digital diagnostics functions.

Product Features

- Supports up to 11.3Gbps bit rates
- Hot-pluggable SFP+ footprint
- 1310nm DFB laser and PIN photodiode, Up to 10km for SMF transmission
- Compliant with SFP+ MSA and SFF-8472 with duplex LC receptacle
- Compatible with RoHS
- Single +3.3V power supply
- Power dissipation <1.2W
- Real Time Digital Diagnostic Monitoring
- Operating case temperature: 0 to +70°C

Applications

- 100BASE-FX/1000BASE-LX/10GBASE-LR Ethernet
- SONET OC3/12/48/192, SDH STM-1/4/16/64
- 1FC/2FC/4FC/8FC Fiber Channel
- 6.144 and 9.83Gbps CPRI
- Other Optical links

Regulatory Compliance

Feature	Standard	Performance
Electromagnetic Interference (EMI)	FCC Part 15 Class B EN 55022:2010, Class B	Compatible with standards
Electromagnetic susceptibility (EMS)	EN 55024:2010	Compatible with standards
Laser Eye Safety	FDA 21CFR 1040.10 and 1040.11 EN60950, EN (IEC) 60825-1,2	Compatible with Class I laser product

Ordering Information

Part Number	Description
T1-SFP-10G-LR	SFP+ 10G 1310nm 10km optical transceiver with full real-time digital diagnostic monitoring

For more information:

T1Nexus

Address: 4701 Patrick Henry Drive, Bldg 16, Santa Clara, CA 95054

Toll-free phone number: 1-877-T1Nexus (1-877-816-3987)

Email: sales@t1nexus.com

General Specifications

Parameter	Symbol	Min	Typ	Max	Unit	Notes
Storage Temperature	TS	-40		85	°C	
Operating Case Temperature	TOP	0		70	°C	
Power Supply Voltage	V _{CC}	-0.3		3.6	V	
Relative Humidity (non-condensation)	RH	0		85	%	
Input Voltage	V _{in}	-0.3		V _{CC} +0.3	V	
Power Supply Voltage	V _{CC}	3.135	3.3	3.465	V	
Power Consumption				1	W	
Data Rate	DR		10.3		Gbps	
Link Distance with MMF	D			10	km	

Optical Characteristics - Transmitter

Parameter	Symbol	Min	Typ	Max	Unit	Notes
Support data rate		1.25		11.3	Gb/s	
Center Wavelength	λ_c	1260	1310	1355	nm	
Spectral Width (-20dB)	$\Delta\lambda$			1	nm	
Side Mode Suppression Ratio	SMSR	30			dB	
Average Optical Output Power	P _o	-8.2		0.5	dBm	
Optical Modulation Amplitude	POMA	-5.2			dBm	
@10.3125Gb/s and Fiber Channel						
Extinction Ratio	Er	3.5			dB	
Transmitter and dispersion penalty	TDP			3.2	dB	
Output Power with Transmitter Disabled	P _{off}			-30	dBm	
Transmitter Enable Voltage	V _{EN}	-0.3		0.8	V	
Transmitter Disable Voltage	V _D	2.0		V _{CC} +0.3	V	
Differential Data Input Swing	V _{INpp}	100		1000	mV	
Rise/fall time (20%-80%)	T _f /t _r			50	ps	
RIN12OMA	RIN12			-128	dB/Hz	
Optical return loss tolerance				-12	dB	
Output Eye Diagram			Compliant with IEEE 802.3			1

Optical Characteristics - Reciever

Parameter	Symbol	Min	Typ	Max	Unit	Notes
Support data rate		1.25	10.3125	11.3	Gb/s	
Operate Wavelength		1260		1580	nm	
Receiver sensitivity (BER of 1E-12) @10.3125Gb/s	Sen1			-14.4	dBm	2
Saturation(BER of 1E-12)	Psat	0.5			dBm	2
LOS Asserted	T_loss_on	-30			dBm	High level: Alarm
LOS De-Asserted	T_loss_off			-16	dBm	
LOS Hysteresis	T_loss_Hs	0.5		5.0	dB	
Differential Data Output Swing	VOUTPP	300		850	mV	
LOS Low Voltage	VLout			0.4	V	
LOS High Voltage	VHout	2.0			V	

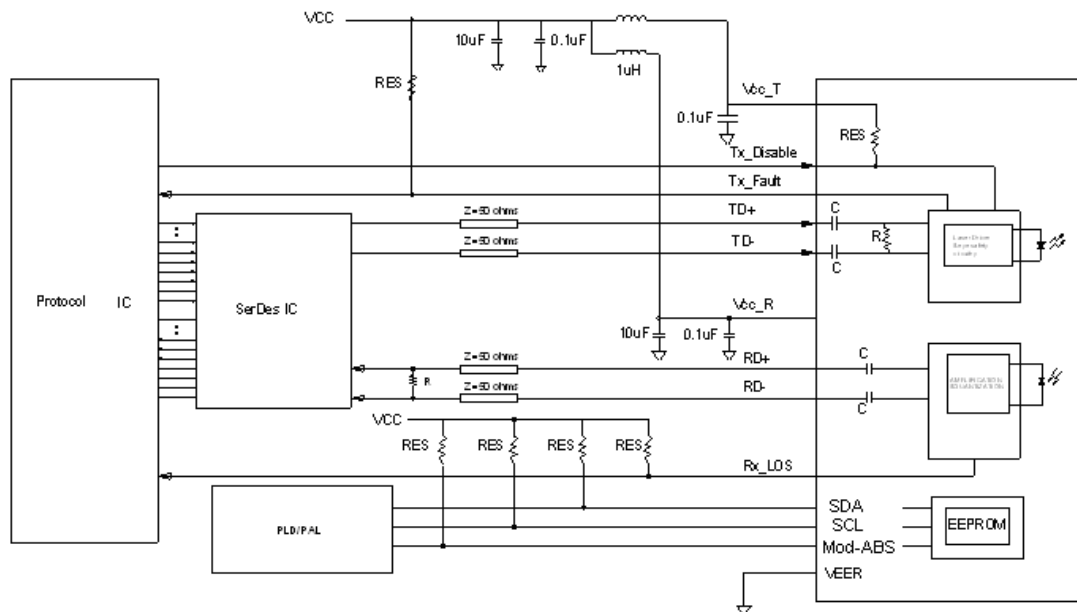
Notes:

1. At least 1000 waveforms acquired, with minimum 5% margin against 802.3 mask
2. Test at 10.3125Gb/s, PRBS 231-1, BER of 1E-12, NRZ and including back to back

Digital Diagnostic Functions

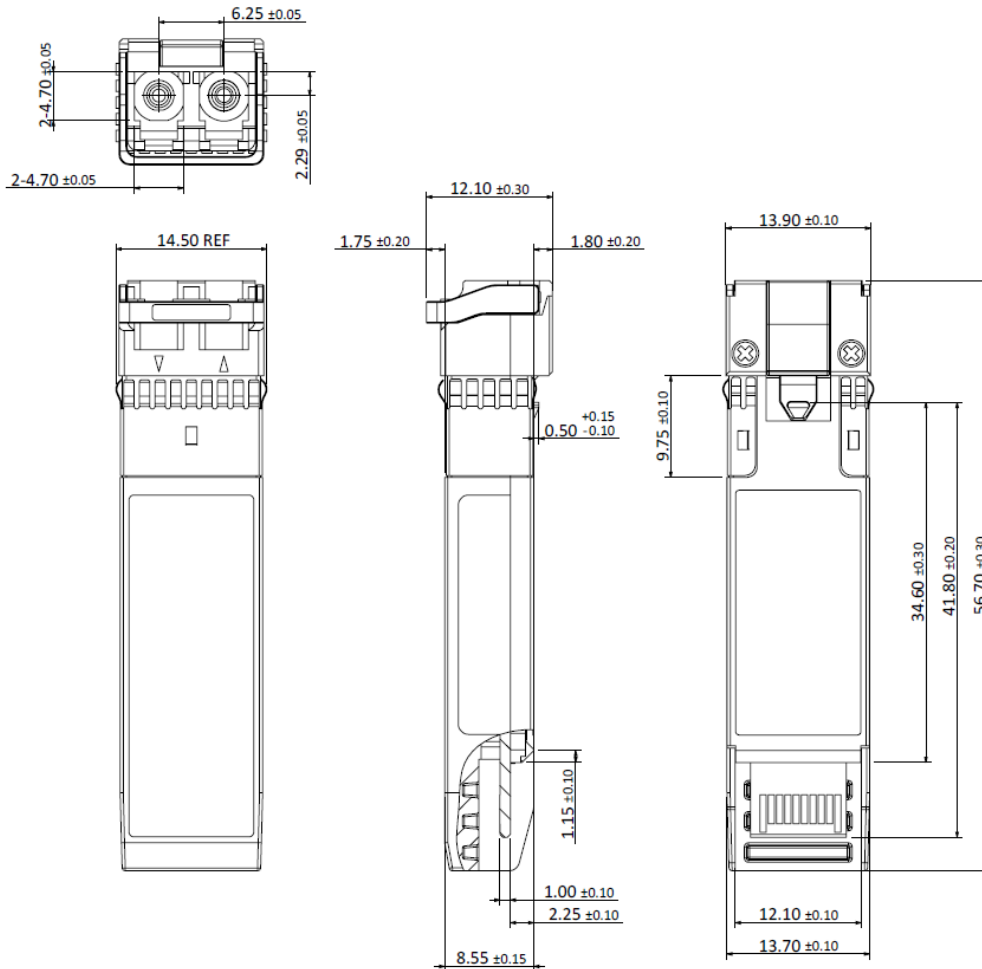
Parameter	Symbol	Min	Max	Unit	Notes
Temperature monitor absolute error	DMI_Temp	-3	+3	°C	
Supply voltage monitor absolute error	DMI_VCC	-3%	+3%	V	
TX power monitor absolute error	DMI_RX	-3	+3	dB	
RX power monitor absolute error	DMI_RX	-3	+3	dB	
Bias current monitor	DMI_Ibias	-10%	+10%	mA	

Recommended Circuit



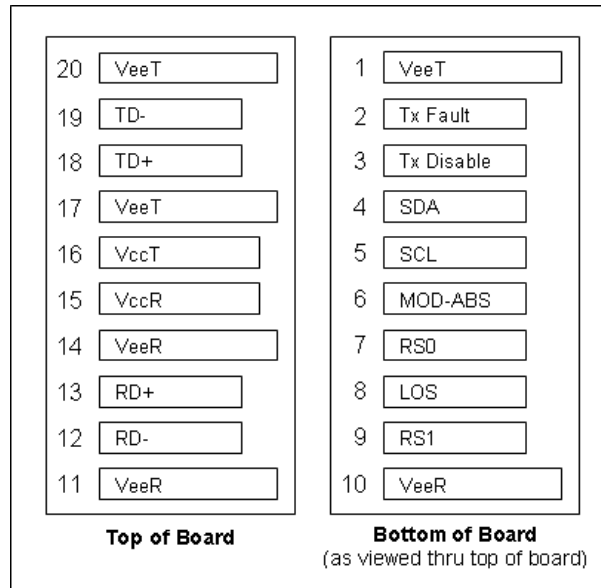
NOTE: 4.7K ohms<RES<10K ohms

Mechanical Dimension



(Unit: mm [inch])

Electrical Pad Layout



Pin Assignment

PIN #	Symbol	Description	Notes
1	VeeT	Transmitter Ground	-
2	TX Fault	Transmitter Fault Indication	1
3	TX Disable	Transmitter Disable	2, Module disables on high or open
4	SDA	2-wire Serial Interface Data Line (Same as MOD-DEF2 in INF-8074i)	
5	SCL	2 Wire Serial Interface Data Line (Same as MOD-DEF1 as defined in the INF-8074i)	
6	MOD-ABS	Module Absent, Connected to VeeT or VeeR in the module.	Note 3
7	RS0	SFP+ RX Rate Select, optional	Rate Select 0, Not used. 9
8	LOS	Loss of Signal	4
9	RS1	SFP+ TX Rate Select, optional	Rate Select 1, Not used. 9
10	VeeR	Receiver Ground	5
11	VeeR	Receiver Ground	5
12	RD-	Inv. Received Data Out	6
13	RD+	Received Data Out	6
14	VeeR	Receiver Ground	5
15	VccR	Receiver Power	7, 3.3V 5%

16	VccT	Transmitter Power	7, 3.3V 5%
17	VeeT	Transmitter Ground	5
18	TD+	Transmit Data In	8
19	TD-	Inv. Transmit Data In	8
20	VeeT	Transmitter Ground	5

Notes:

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–10KΩ resistor on the host board. Pull up voltage between 2.0V and VccT +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 < 0.4V.
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 states are:
 Low (-0.3 – 0.8V): Transmitter on (>0.8, < 2.0V): Undefined
 High (2.0 –VccT+0.3V): Transmitter Disabled Open: Transmitter Disabled
3. Mod-ABS shall be pulled up with a 4.7K – 10KΩ resistor on the host board. The pull-up voltage shall be VccT or VccR.
4. 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 VccR+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 < 0.4V.
5. VeeR and VeeT may be internally connected within the SFP module.
6. RD-/+ : These are the differential receiver outputs. They are AC coupled 100Ω differential lines which should be terminated with 100Ω (differential) at the user SERDES. The AC coupling is done inside the module and is thus not required on the host board.
7. VccR and VccT are the receiver and transmitter power supplies. They are defined as 3.3V at the SFP connector pin. Maximum supply current is 300mA. Recommended host board power supply filtering is shown below. Inductors with DC resistance of less than 1Ω should be used in order to maintain the required voltage at the SFP input pin with 3.3V supply voltage.
 When the recommended supply filtering network is used, hot plugging of the SFP transceiver module will result in an inrush current of no more than 30 mA greater than the steady state value. VccR and VccT may be internally connected within the SFP transceiver module.
8. TD-/+ : These are the differential transmitter inputs. They are AC-coupled, differential lines with 100Ω differential termination inside the module. The AC coupling is done inside the module and is thus not required on the host board.
9. Internally pulled down per SFF-8431 Rev 4.1.