10G Ethernet SFP+ Series

40KM

Datasheet

Features:

- Operating data rate is 11.3Gbps
- Distance up to 300m~80km
- Single 3.3V Power supply and TTL Logic Interface
- Duplex LC Connector Interface
- Hot Pluggable
- Compliant with MSA SFP Specification
- Compliant with Telcordia GR-253-CORE and IEEE802.3ae
- Digital Diagnostic Monitor Interface Compatible with SFF-8472
- Operating Case Temperature
  Standard: -5℃~+70℃
  Industrial: -40℃~+85℃

Applications:

- 10GBASE-SR/SW/LR/LW/ER/EW/ZR/ZW
- 10G Fiber Channel
- Other Optical Link

Product Description

Trixon SFP+ series products is small form factor (10 Gb/s) pluggable transceiver for duplex optical data communications. It' s comply with SFP+ multi-source agreement (MSA: SFF-8431), also be comply with 10-Gigabit Ethernet IEEE802.3ae and 10G Fiber Channel. The Digital diagnostics functions and standard transceiver serial ID information are available via a 2-wire serial interface according SFP+MSA, the transceiver is RoHS compliant and lead-free per Directive 2002/95/EC and 2005/747/EC.

Trixon confidential

Ordering information

Part No.	Data Rate	Laser	Fiber Type	Distance*Note1	Optical Interface	Bail Color	Temp. *Note2	DDMI
TPS-TG40-55DCR	11.3Gbps	1550nm-EML	SMF	40km	LC	Red	ST	Y
TPS-TG40-55DIR	11.3Gbps	1550nm-EML	SMF	40km	LC	Red	IT	Y

Note1: 300m with 50/125μm OM3 MMF, 2km/10km/40km/80km with 9/125μm SMF

Note2: ST: -5 ~ +70 deg C IT: -40 ~ +85 deg C

Regulatory Compliance

Feature	Standard	Performance
Electrostatic Discharge (ESD) to the Electrical Pins	MIL-STD-883G Method 3015.7	HBM class 1, 1000volts and above, Contact discharge on Golden Finger.
Electrostatic Discharge to the enclosure	IEC-61000-4-2 GR-1089-CORE	Compliant with standards.
Electromagnetic Interference (EMI)	FCC Part 15 Class B EN55022:2006 VCCI Class B	Compliant with standards Noise frequency range: 30MHz to 18 GHz. System margins depend on customer host board and chassis design.
Immunity	IEC 61000-4-3	Compliant with standards.
Laser Eye Safety	FDA 21CFR 1040.10 and 1040.11 EN (IEC) 60825-1:2007 EN (IEC) 60825-2:2004+A1	CDRH compliant and Class I laser product.
Component Recognition	UL and CUL EN60950-1:2006	Compliant with standards.
RoHS6	2002/95/EC 4.1&4.2 2005/747/EC 5&7&13	Compliant with standards*note3

Note3:

In light of item 5 in RoHS exemption list of RoHS Directive 2002/95/EC, Item 5: Lead in glass of cathode ray tubes, electronic components and fluorescent tubes.

In light of item 13 in RoHS exemption list of RoHS Directive 2005/747/EC, Item 13: Lead and cadmium in optical and filter glass.

The three exemptions are being concerned for Trixon transceivers, because Trixon transceivers use glass, which may contain Pb, for components such as lenses, windows, isolators, and other electronic components.

Absolute Maximum Ratings*Note4

Parameter	Symbol	Min	Max	Unit
Storage Temperature	T_S	-40	+85	℃
Supply Voltage	V_{CC}	0	+4	V
Operating Humidity		5	95	%

Note4: Exceeding any one of these values may destroy the device permanently.

Recommended Operating Conditions

Parameter	Symbol	Min	Typical	Max	Unit	Notes
Operating Case Temperature	T_C	-5	-	70	℃	ST
		-40	-	85	℃	IT
Power Supply Voltage	VCC	3.14	3.3	3.47	V	
Power Supply Current	I_{cc}	-	-	300	mA	300m\2km\10km
		-	-	450	mA	40km\80km
Bit Rate		9.95	10.3	11.3	Gbps	
I2C Clock Frequency	f_{cl}	-	-	100	kHz	

Performance Specifications – Electrical

Parameter	Symbol	Min	Typ.	Max	Unit	Notes
Transmitter						
TX CML Inputs Voltage (Differential)	Vin	150	-	950	mVpp	AC coupled inputs
Input Impedance (Differential)	Zin		100		ohm	
Tx_DISABLE Input Voltage – High		1.7	-	Vcc+0.3	V	
Tx_DISABLE Input Voltage – Low		-0.3	-	0.8	V	
Tx_FAULT Output Voltage – High		2	-	-	V	OC output, should be pull up with 4.7K – 10 KΩ on the host board
Tx_FAULT Output Voltage – Low		-	-	0.4	V	I_{OL} = 1mA
Receiver						
CML Outputs Voltage (Differential)	Vout	300	-	850	mVpp	AC coupled outputs
Output Impedance (Differential)	Zout	-	100	-	ohm	
RX_LOS Output Voltage – High	V_{OH}	2.5	-	-	V	OC output, should be pull up with 4.7K – 10 KΩ on the host board
Rx_LOS Output Voltage – Low	V_{OL}	-	-	0.4	V	I_{OL} = 1mA

Timing Specifications

Parameter	Symbol	Min	Typ.	Max	Unit
TX Disable Assert Time	T_off	-	-	100	us
TX Disable Negate Time	T_on	-	-	2	ms
Time to initialize, include reset of TX_FAULT	T_start_up	-	-	300	ms
TX_FAULT from fault to assertion	Tx_Fault_on	-	-	1	ms
RX_LOS Assert Time	T_los_on	-	-	100	us
RX_LOS De-Assert Time	T_los_off	-	-	100	us

MOD_DEF (0:2)

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Performance Specifications – Optical

（1550nm EML and PIN，40km）

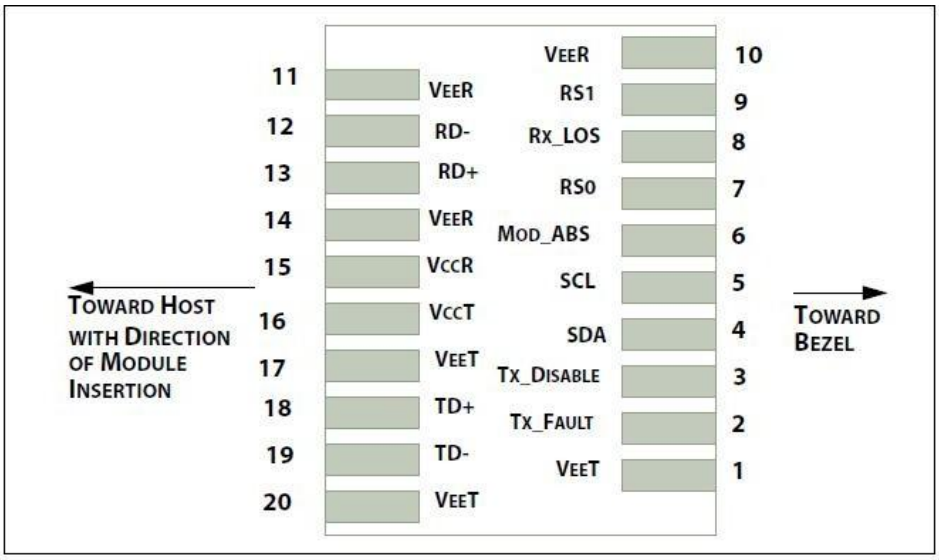
Parameter	Symbol	Min	Typ.	Max	Unit
Transmitter					
Centre Wavelength	λc	1530	-	1565	nm
Spectral Width (-20dB)	**Δλ**	-	-	0.3	nm
Side Mode Suppression Ratio	SMSR	30	-	-	dB
Average Output Power*[note11]	Pout	-4	-	4.7	dBm

Extinction Ratio	ER	3	-	-	dB
Average Power of OFF Transmitter	Pout-off	-	-	-30	dBm
Transmitter Dispersion Penalty	TDP	-	-	3.0	dB
Optical Return Loss Tolerance	ORLT	-	-	21	dB
Output Optical Eye	Compliant with IEEE802.3ae-2005				
Receiver					
Centre Wavelength	λc	1265	-	1610	nm
Receiver Sensitivity*[note12]	SEN	-	-	-15.8	dBm
Receiver Overload	P_{max}	-1	-	-	dBm
LOS De-Assert	LOS_D	-	-	-16.5	dBm
LOS Assert	LOS_A	-30	-	-	dBm
LOS Hysteresis	LOS_H	0.5	-	4	dB

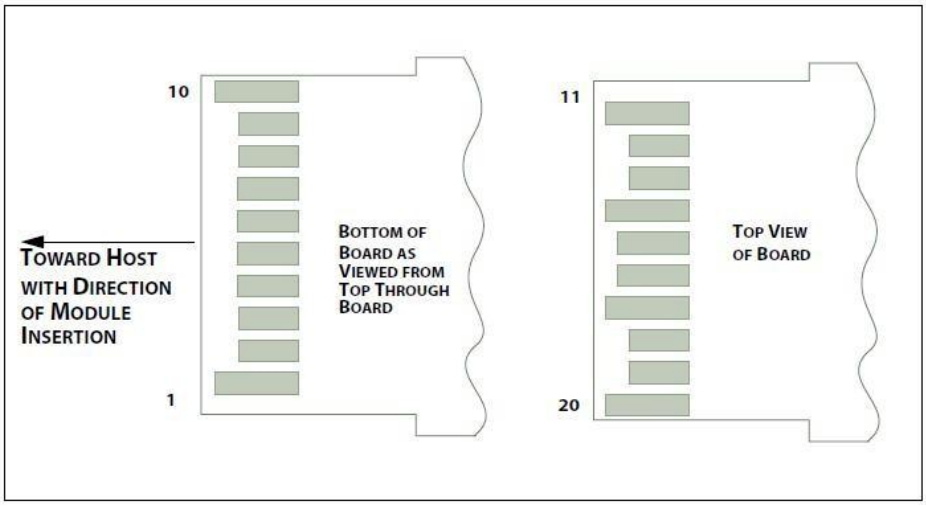
Note11: Output is coupled into a 9/125um SMF. The typical value is +0.5dBm.

Note12: Measured with a PRBS 2^{31}-1 test pattern @10.3125Gbps, BER≤10-12.

SFP Transceiver Electrical Pad Layout



Host PCB SFP+ pad assignment top view



SFP+ module contact assignment

Pin Function Definitions

Pin Num.	Name	Function	Plug Seq.	Notes
1	VeeT	Transmitter Ground	1	Note 19
2	TX Fault	Transmitter Fault Indication	3	Note 15
3	TX Disable	Transmitter Disable	3	Note 16, Module disables on high or open.
4	SDA	Module Definition 2	3	2-wire Serial Interface Data Line.
5	SCL	Module Definition 1	3	2-wire Serial Interface Clock.
6	MOD-ABS	Module Definition 0	3	Note 17
7	RS0	RX Rate Select (LVTTL).	3	Rate Select 0, optionally controls SFP+ module receiver. This pin is pulled low to VeeT with a >30K resistor..
8	LOS	Loss of Signal	3	Note 18
9	RS1	TX Rate Select (LVTTL).	1	Rate Select 1, optionally controls SFP+ module transmitter. This pin is pulled low

				to VeeT with a >30K resistor
10	VeeR	Receiver Ground	1	Note 19
11	VeeR	Receiver Ground	1	Note 19
12	RD-	Inv. Received Data Out	3	Note 20
13	RD+	Received Data Out	3	Note 20
14	VeeR	Receiver Ground	1	Note 19
15	VccR	Receiver Power	2	3.3V ± 5%, Note 21
16	VccT	Transmitter Power	2	3.3V ± 5%, Note 21
17	VeeT	Transmitter Ground	1	Note 19
18	TD+	Transmit Data In	3	Note 22
19	TD-	Inv. Transmit Data In	3	Note 22
20	VeeT	Transmitter Ground	1	Note 19

Note15: TX Fault is an open collector/drain output, which should be pulled up with a 4.7K – 10K_ 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.

Note16: TX disable is an input that is used to shut down the transmitter optical output. It is pulled up within the module with a 4.7K – 10 K_ resistor. Its states are: Low: Transmitter on; High: Transmitter Disabled; Open: Transmitter Disabled.

Note17: Module Absent, connected to VeeT or VeeR in the module.

Note18: LOS (Loss of Signal) is an open collector/drain output, which should be pulled up with a 4.7K –10K_ 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.

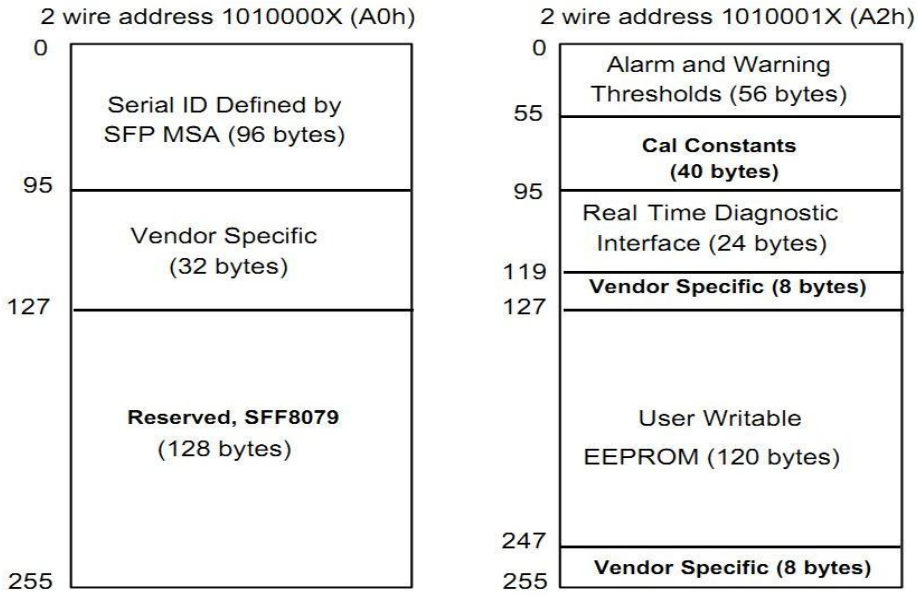
Note19: The module signal ground contacts, VeeR and VeeT, should be isolated from the module case.

Note20: RD-/+: These are the differential receiver outputs. They are AC coupling that is done inside the module and is thus not required on the host board.

Note21: VccR and VccT are the receiver and transmitter power supplies. They are defined as 3.3V ±5% at the SFP connector pin. Inductors with DC resistance of less than 1 ohm should be used in order to maintain the required voltage at the SFP input pin with 3.3V supply voltage. VccR and VccT may be internally connected within the SFP transceiver module.

Note22: TD-/+: These are the differential transmitter inputs. They are AC-coupled that is done inside the module and is thus not required on the host board.

Digital Diagnostic Functions



Digital Diagnostic Memory Map Specific Data Field Descriptions

1) Trixon SFP+ transceiver support the 2-wire serial communication protocol as defined in SFP MSA, in which defines a 256-byte memory map in EEPROM at 8 bit address 1010000X (A0h). The digital diagnostic monitoring interface be assigned with 8 bit address 1010001X (A2h). Additionally, SFP transceivers provide a unique digital diagnostic monitoring interface (DDMI), which allows real-time access to product operating parameters such as transceiver supply voltage, transceiver temperature, transmitted optical power, laser bias current and received optical power. It also defines alarm and warning threshold, which alerts end-users when particular operating parameters are outside of factory setting.
2) When the serial protocol is activated, the serial clock signal (SCL, Mod Def 1) is generated by the host. The positive edge clocks data into those segments of the EEPROM that are not write-protected. The negative edge clocks data from the SFP transceiver. The serial data signal (SDA, Mod Def 2) is bi-directional for serial data transfer. The host uses SDA in conjunction with SCL to mark the start and end of serial protocol activation. The memories are organized as a series of 8-bit data words that can be addressed individually or sequentially.
3) Digital diagnostics for the TPS-TGxx-xxDxR are internally calibrated by default: Calibration and alarm/warning threshold data is written during device manufacturing.

Digital Diagnostic Monitoring Specifications

Monitor accuracy

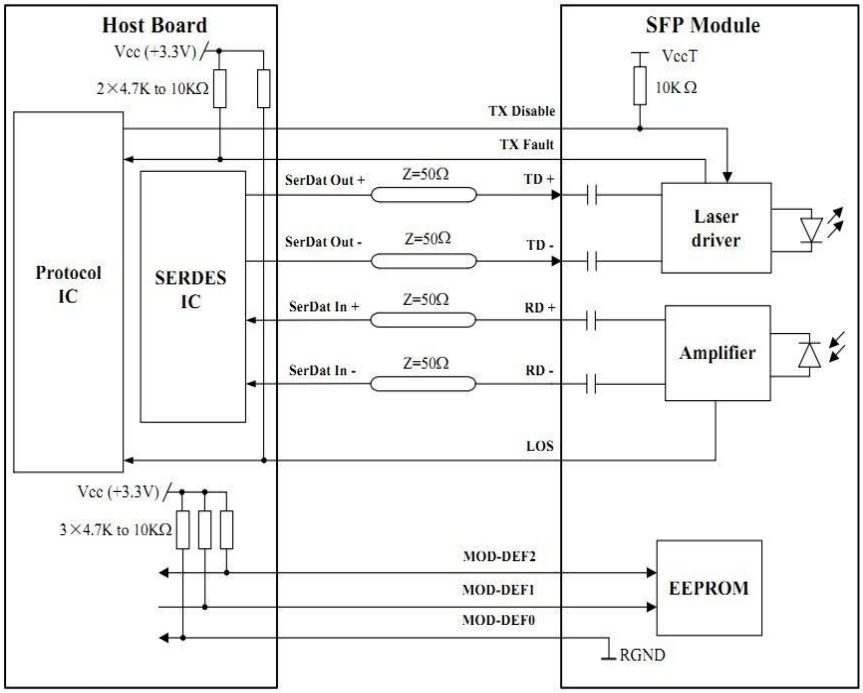
Parameter	Min	Typ	Max	Units
Internally measured transceiver temperature	-	-	±3	°C
Internally measured transceiver supply voltage	-	-	±3%	V
Measured TX bias current	-	-	±10	%
Measured TX output power	-	-	±3	dBm
Measured RX received average optical power	-	-	±3	dBm

Dynamic range for operation*Note23

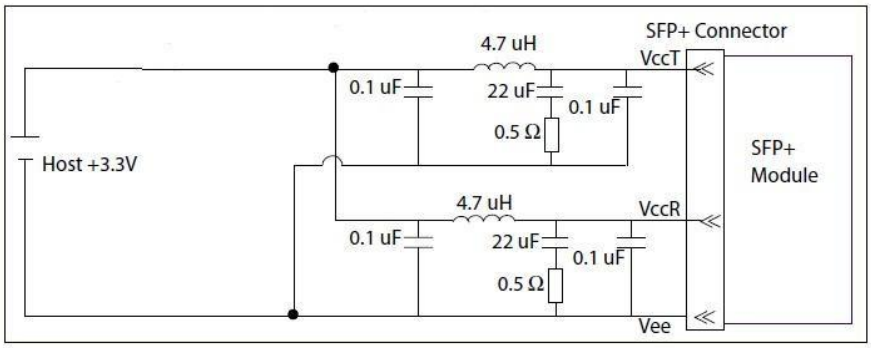
Parameter		H-Alarm	H-Warning	L-Warning	L-Alarm	Units
Internally measured transceiver temperature	ST	+85	+80	-5	-10	°C
	IT	+100	+95	-35	-40	
Internally measured transceiver supply voltage		3.63	3.47	3.13	2.97	V
Measured TX bias current	VCSEL Laser	12	11	2	1	mA
	FP/DFB Laser	120	110	10	5	
	EML Laser	130	120	10	5	
Measured TX output power		Pout_MAX+1	Pout_MAX	Pout_MIN	Pout_MIN-1	dBm
Measured RX received average optical power		Overload+1	Overload	SEN	SEN-2	dBm

Note23: It is permissible to be adjusted according to the manufacturer' s testing result.

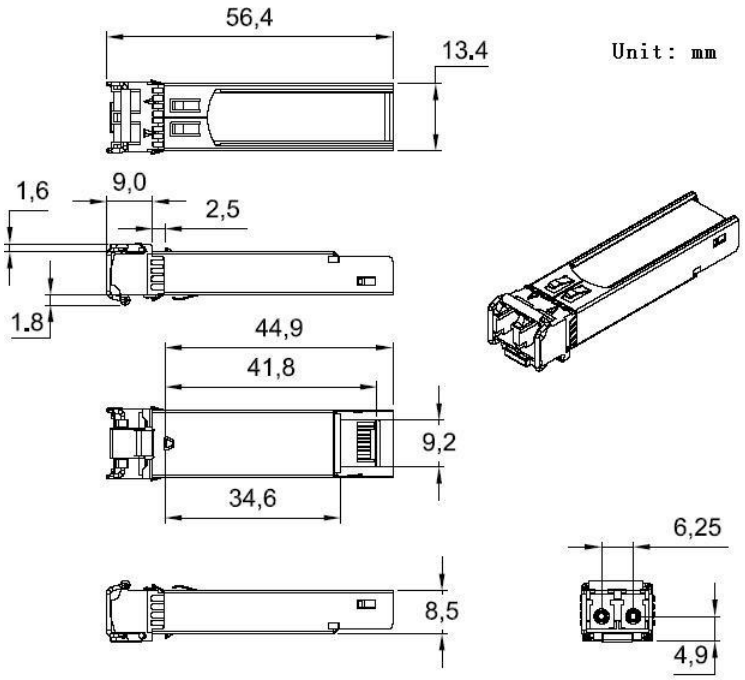
Recommended Circuit



Recommended Host Board Power Supply Circuit



Mechanical Dimension



Eye Safety

These transceivers are Class 1 laser products. It complies with IEC-60825 and FDA 21 CFR 1040.10 and 1040.11. The transceiver must be operated within the specified temperature and voltage limits. The optical ports of the module shall be terminated with an optical connector or with a dust plug.

Obtaining Document

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