

Product Specification

10GBd SFP+ 850nm Limiting Transceiver

TRX10GVP2010



Product Features:

- Hot pluggable SFP+ optical transceiver
- 10G Ethernet
- Data rate transparent from 9.95Gbps to 11.3Gbps
- Low power consumption, <0.6W typ.
- Excellent EMI performance
- Transmission distance up to 300m OM3 MMF
- 0°C to +70°C case operating temperature
- 850nm VCSEL laser
- Duplex LC connector
- Laser Class 1
- RoHS 6/6 compliant

Applications:

10Gbit/s Ethernet 10GBASE-SR/SW

MergeOptics' SFP+ optical transceiver TRXGVP2010 is compliant with the current SFP+ MSA specifications (SFF-8431 and SFF-8432) and with 10GBASE-SR/SW per IEEE 802.3ae. It is RoHS 6/6 complaint per Directive 2002/95/EC and laser class 1 safety compliant per IEC/CDRH. The sub watt power consumption and the excellent EMI performance allow system design with high port density.

Supported Standards

Application	Standard	Data Rate
10G Ethernet LAN	IEEE 802.3ae 10GBASE-SR	10.3125GBd
10G Ethernet WAN	IEEE 802.3ae 10GBASE-SW	9.95328GBd

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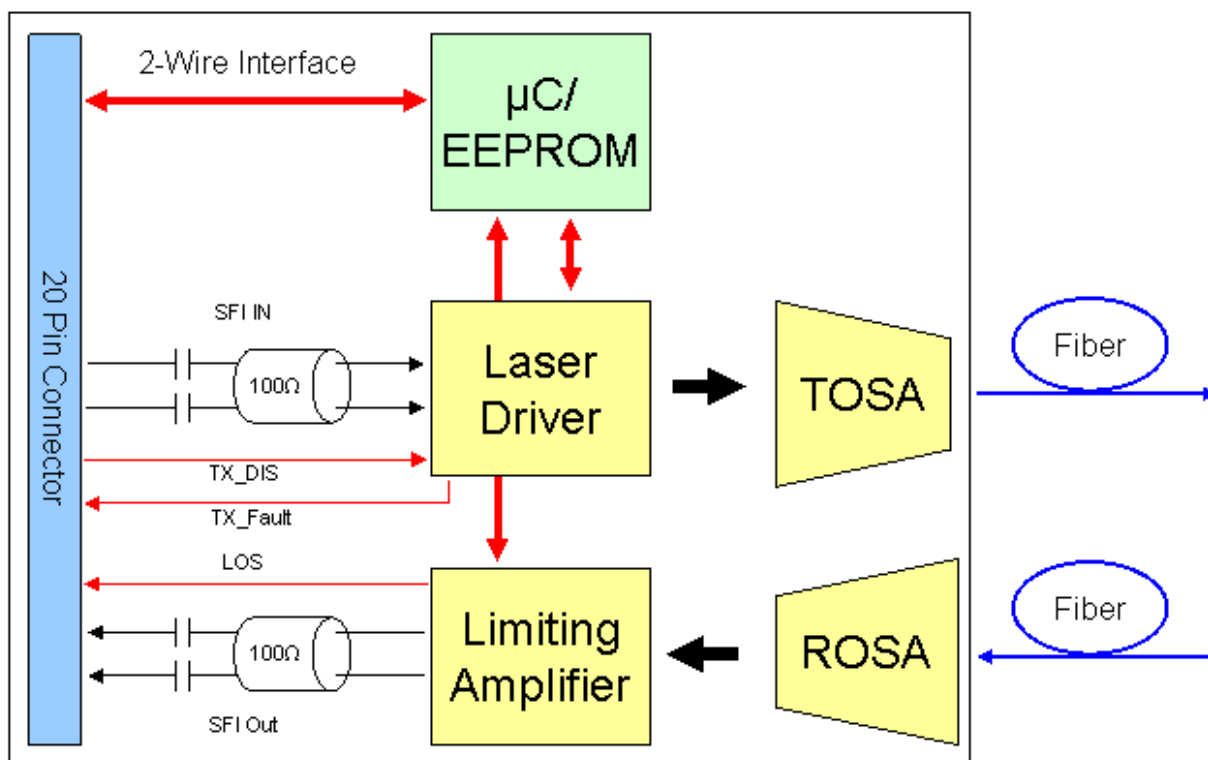
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Functional Description

The transmit path is based on an AC coupled 100 ohm differentially terminated driver coupled to an 850nm VCSEL. Laser output may be disabled by pulling the transmitter disable (TX_DIS) line high which is its default state when leaving input floating due to an internal pull-up resistor. A fault condition is raised upon detection of an abnormal laser state.

The receive path consists of a receiver optical sub-assembly (ROSA) for optical to electrical conversion, followed by a limiting amplifier boosting the electrical signal. A loss of signal (LOS) status line provides information to facilitate easy link detection.

Complete digital optical monitoring is implemented in compliance to SFF-8472 and made accessible via the 2-wire interface providing real time information about all important module parameters and status information.



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Electrical Characteristics

Absolute Maximum Ratings

Rating	Conditions	Symbol	Min	Max	Units
Storage Ambient Temperature		θ_{stg}	-40	+85	°C
Powered Case Temperature		θ_c	0	+75	°C
Operating Relative Humidity	Non condensing	RH	0	95	%
Supply Voltage Range		V_{CC3}	-0.5	4.0	V

Any stress beyond the maximum ratings may result in permanent damage to the device. Specifications are guaranteed only under recommended operating conditions.

Recommended Operating Conditions

Parameter	Conditions	Symbol	Min	Typ	Max	Units
Operating Case Temperature	altitude of < 3km	θ_{Case}	0		+70	°C
Power Supply Voltage		V_{CC3}	3.135	3.30	3.465	V
DC Common Mode Voltage		V_{CM}	0		3.6	V

Low Speed Characteristics

Parameter	Conditions	Symbol	Min	Typ	Max	Units
Supply Current Transmitter	@ V_{CCTX}	$I_{V_{CCTX}}$			100	mA
Supply Current Receiver	@ V_{CCRX}	$I_{V_{CCRX}}$			120	mA
Power Consumption				0.55	0.75	W
TX_Fault, RX_LOS	Host Vcc Range 2V – 3.47V	V_{OL}	0		0.4	V
		V_{OH}	Host_Vcc – 0.5		Host_Vcc + 0.3	
TX_Dis, RS0, RS1	Low Voltage TTL	V_{IL}	-0.3		0.8	
		V_{IH}	2.0		VccT + 0.3	
SCL, SDA	Host Vcc Range 3.14V – 3.47V	V_{IL}	-0.3		VccT* 0.3	
		V_{IH}	VccT* 0.7		VccT + 0.5	
		V_{OL}	0.0		0.4	
		V_{OH}	Host_Vcc – 0.5		Host_Vcc + 0.3	

SFI Module Transmitter Input Characteristics

Parameter	Conditions	Symbol	Min	Typ	Max	Units
Nominal Data Rate		V_{ID}		10.3125		Gbd
Reference Differential Input Impedance		Z_d		100		Ω
Input AC Common Mode Input Voltage			0		25	mV (RMS)

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Differential Input Voltage Swing		V_{ID}	150		900	mV
Differential Input S-parameter	0.01 – 3.9GHz	SDD11			-10	dB
	3.9 – 11.1GHz		¹⁾		¹⁾	dB
Differential to Common Mode Conversion ²⁾	0.01 – 11.1GHz	SCD11			-10	dB
Total Jitter		TJ			0.28	UI(p-p)
Data Dependant Jitter		DDJ			0.1	UI(p-p)
Uncorrelated Jitter		UJ			0.023	RMS

- 1) Differential Return Loss given by equation $SDD11(dB) = -8 + 13.33 \log_{10}(f/5.5)$, with f in GHz
2) Common mode reference impedance is 25Ω. Differential to common mode conversion relates to generation of EMI

SFI Module Receiver Output Characteristics

Parameter	Conditions	Symbol	Min	Typ	Max	Units
Nominal Data Rate				10.3125		Gbd
Reference Differential Output Impedance		Z_d		100		Ω
Termination Mismatch		ΔZ_d			5	%
Output AC Common Mode Voltage					15	mV (RMS)
Differential Output Amplitude	$R_{Load} = 100\Omega$, Differential	V_{OSPP}	350		800	mV
Output Rise and Fall time	20% to 80%	t_{RH}, t_{FH}			35	ps
Differential Output S-parameter	0.01 – 3.9GHz	SDD22			-10	dB
	3.9 – 11.1GHz				¹⁾	dB
Common Mode Output Return Loss ²⁾	0.01 – 6.5GHz	SCC22			-7	dB
	6.5 – 11.1GHz				-3	dB
Deterministic Jitter		DJ			0.42	UI(p-p)
Total Jitter	See SFP+ MSA	TJ			0.7	UI(p-p)

- 1) Return Loss given by equation $Sxx22(dB) = -8 + 13.33 \log_{10}(f/5.5)$, with f in GHz
2) Common mode reference impedance is 25Ω. Common mode return loss helps absorb reflection and noise improving EMI

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Optical Characteristics

General Parameters

Parameter	Conditions	Min Modal Bandwidth (MHz*km)	Symbol	Min	Typical 1Gb/s	Typical 10Gb/s	Units
Operating Range	62.5 µm MMF	160	I_{OP}	2	220	26	m
	50 µm MMF	400		2	500	66	
	62.5 µm MMF	200		0.5	275	33	
	50 µm MMF	500		0.5	550	82	
	50 µm MMF	2000		0.5	X	300	

Optical Transmitter

Parameter	Conditions	Symbol	Min	Typ	Max	Units
Nominal Wavelength		λ_{TRP}	840	850	860	nm
Spectral Width		$\Delta\lambda$			0.45	
Average Launch Power		P_{avg}	-7.3		-1	dBm
Extinction Ratio		ER	3.5			dB
Relative Intensity Noise		RIN			-128	dB/Hz

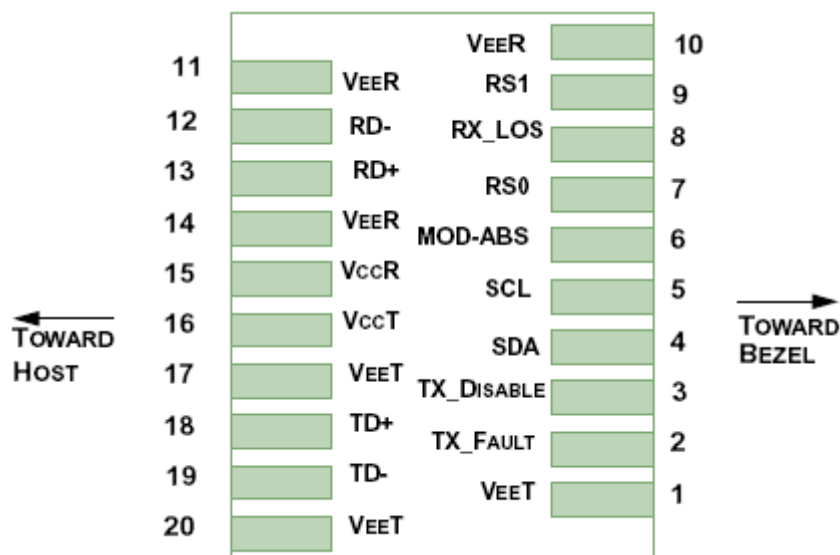
Optical Receiver

Parameter	Conditions	Symbol	Min	Typ	Max	Units
Maximum Input Power		P_{MAX}			-1	dBm
Center Wavelength		λ_C	840	850	860	nm
Receiver Sensitivity	PRBS 2 ³¹ -1, BER < 1*10 ⁻¹² @10.3125Gb/s	$P_{IN(OMA)}$	-11.1			dBm
Stressed Receiver Sensitivity	PRBS 2 ³¹ -1, BER < 1*10 ⁻¹² @ 10.3125Gb/s	$P_{IN(OMA)}$	-7.5			dBm
Loss of Signal		P_{av_as}	-30			dBm
		P_{OMA_deas}			-13	

Note: The specified characteristics are met within the recommended range of operating. Unless otherwise noted typical data are quoted at nominal voltages and +25°C ambient temperature.

Application Information

Connector Pinout



Electrical Pin Definition

PIN	Logic	Symbol	Name / Description	Note
1		VeeT	Module Transmitter Ground	1
2	LVTTL-O	TX_Fault	Module Transmitter Fault	
3	LVTTL-I	TX_Dis	Transmitter Disable; Turns off transmitter laser output	
4	LVTTL-I	SCL	2-Wire Serial Interface Clock	2
5	LVTTL-I/O	SDA	2-Wire Serial Interface Data Line	2
6		MOD_DEF0	Module Definition, Grounded in the module	
7	LVTTL-I	RS0	Receiver Rate Select	
8	LVTTL-O	RX_LOS	Receiver Loss of Signal Indication Active LOW	
9	LVTTL-I	RS1	Transmitter Rate Select	
10		VeeR	Module Receiver Ground	1
11		VeeR	Module Receiver Ground	1
12	CML-O	RD-	Receiver Inverted Data Output	
13	CML-O	RD+	Receiver Data Output	
14		VeeR	Module Receiver Ground	1
15		VccR	Module Receiver 3.3 V Supply	
16		VccT	Module Receiver 3.3 V Supply	
17		VeeT	Module Transmitter Ground	1
18	CML-I	TD-	Transmitter Inverted Data Input	
19	CML-I	TD+	Receiver Non-Inverted Data Output	
20		VeeT	Module Transmitter Ground	1

1. Module ground pins GND are isolated from the module case.

2. Shall be pulled up with 4.7K-10Kohms to a voltage between 3.15V and 3.45V on the host board.

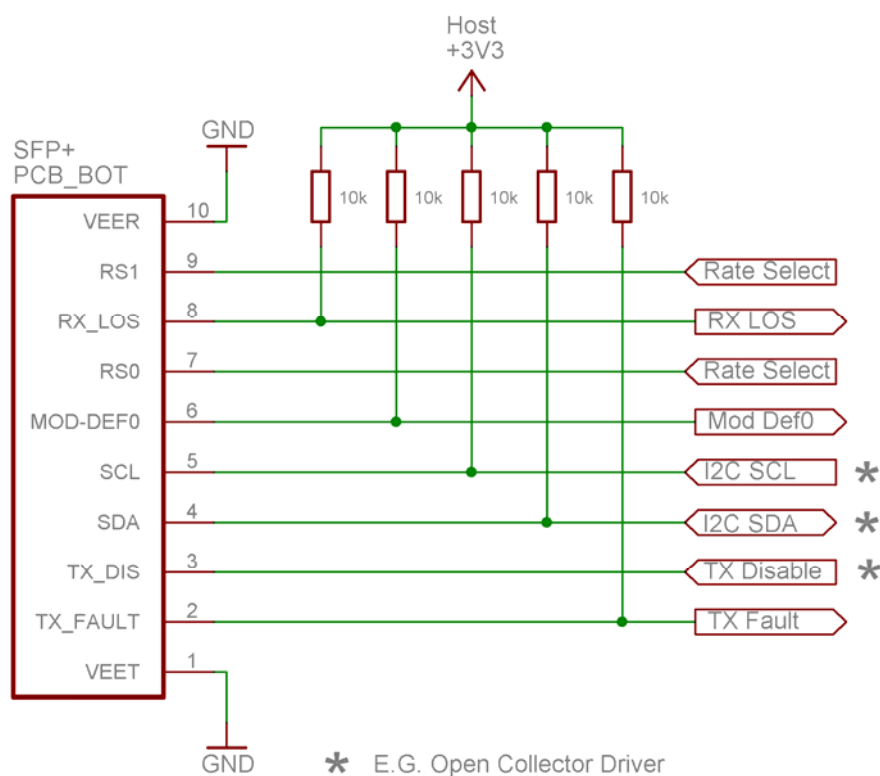
TRX10GVP2010 Datasheet / B/4200-08:74-01

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Recommended electrical connections to transceiver are shown below.

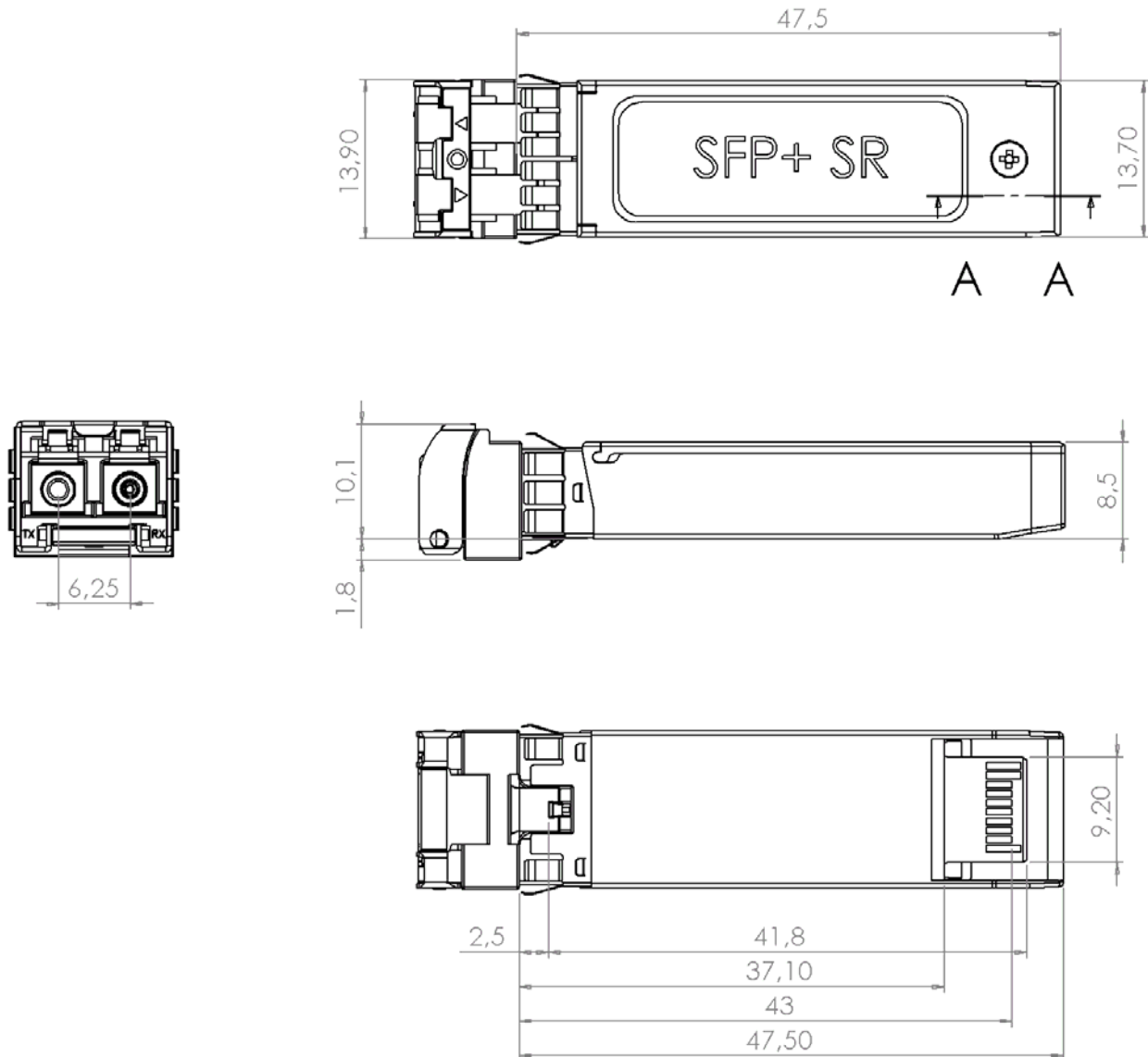


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Module Outline



All dimensions shown are in millimeters.

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Related Information & Compliance

Requirements	Standard
RoHS	RoHS 6/6 Directive 2002/95/EC Amendment 4054 (2005/747/EC)
EMI (Module)	FCC Part 15, Class B EN 55022 Class B CISPR 22

Requirements	Standard	Value
ESD (Electrical connector)	JEDEC JESD22-A114-B	1kV
ESD (Module case)	Air Discharge EN61000-4-2 criterion B	15kV
ESD (Module case)	Contact Discharge EN61000-4-2 criterion B	8kV

Eye Safety

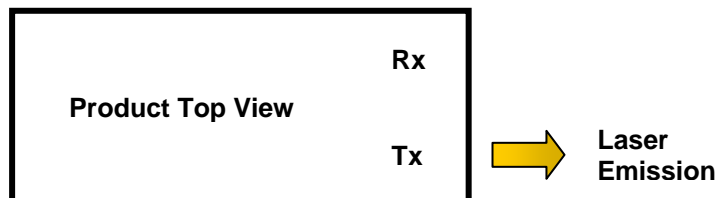
This laser based multimode transceiver is a Class 1 product. It complies with IEC 60825-1 Ed.2: 2007 and FDA performance standards for laser products (21 CFR 1040.10 and 1040.11) except for deviations pursuant to Laser Notice 50, dated June 24, 2007.

CLASS 1 LASER PRODUCT

DO NOT VIEW DIRECTLY WITH OPTICAL INSTRUMENTS

Caution: use of controls or adjustments or performance of procedures other than those specified herein may result in hazardous radiation.

Note: All adjustments have been made at the factory prior to shipment of the devices. No maintenance or alteration to the device is required. Tampering with or modifying the performance of the device will result in voided product warranty. Failure to adhere to the above restrictions could result in a modification that is considered an act of "manufacturing", and will require, under law, recertification of the modified product with the U.S. Food and Drug Administration (ref. 21 CFR 1040.10 (i)).



Wavelength	>840 nm
Accessible Emission Limit (as defined by IEC: 7 mm aperture at 70 mm distance)	<743 μ W

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Application	Standard	Part Number
10G Ethernet LAN	IEEE 802.3ae 10GBASE-SR	TRX10GVP2010
10G Ethernet WAN	IEEE 802.3ae 10GBASE-SW	TRX10GVP2010