



Product Specification

10Gbit/s XFP SR, 850 nm Transceiver

TRX10GVP2001

General Description and Applications

The TRX10GVP2001 is a multi-purpose optical transceiver module for 10Gbit/s data transmission applications at 850nm. It is ideally suited for 10 GbE datacom (belly-to-belly for high density applications) and storage area network (SAN / NAS) applications based on the IEEE 802.3ae and Fibre Channel standards. Designed for short range distances the transceiver module comprises a transmitter with a vertical cavity surface emitting laser (VCSEL) and a receiver with a PIN photodiode. Transmitter and receiver are separate building blocks within the transponder, designed in TO based technology. The transceiver operates within a wide temperature range of 0°C to +70°C and offers optimum heat dissipation and excellent electromagnetic shielding thus enabling high port densities for 10 GbE systems.



Standard	Description	Nominal Baud Rate	Unit
IEEE 802.3ae-2002	10 GBASE-SR	10.3125	GBd
1200-Mxx-SN-I	10G Fibre Channel	10.51875	GBd

FEATURES & BENEFITS

- Fully compliant to XFP MSA Rev. 4.5
- Support of IEEE 802.3ae 10GBASE-SR at 10.3125 Gbit/s
- Compliance to Fibre Channel 1200-M5-SN-I, 1200-M5E-SN-I, 1200-M6-SN-I at 10.51875 Gbit/s
- Compatible with 10.7Gbit/s and 11.3Gbit/s operation for FEC functionality
- Serial ID and digital diagnostics through I2C
- Transmission distance up to 82 m (50 µm MMF) or 300m (high bandwidth MMF; 2000MHz*km)
- Low power consumption 0.9 W (typ.)
- Wide operating temperature range: 0°C to +70°C
- Laser Class 1M compliant
- Vertical Cavity Surface Emitting Laser at 850 nm (VCSEL)
- LC duplex connector
- Hot pluggable 30pin connector
- Compliant with the EU RoHS 6 environmental requirements

Electrical Characteristics

Absolute Maximum Ratings

Rating	Conditions	Symbol	Min	Max	Units
Storage Ambient Temperature Range		ϑ_{stg}	-40	+85	°C
Powered Case Temperature Range		ϑ_c	0	+75	°C
Operating Relative Humidity		RH	8	80	%
Supply Voltage Range @ 5.0V		V_{CC5}	0.5	6.0	V
Supply Voltage Range @ 3.3V		V_{CC3}	0.5	3.6	V
Open Drain VCC Level		V_{OD}		4.0	V
Static Discharge Voltage on XFI High Speed Pins	HBM human body model per JEDEC JESD22-A114-B			500	V
Static Discharge Voltage excluding XFI High Speed Pins	HBM human body model			2,000	V
Static Discharge Voltage on XFP Module	EN61000-4-2 Criterion B: Air Discharge Direct Contact discharge			15,000 8,000	V V

Any stress beyond the maximum ratings can result in permanent damage. The device specifications are guaranteed only under the recommended operating conditions.

Recommended Operating Conditions

Parameter	Conditions	Symbol	Min	Typ	Max	Units
Operating Case Temperature Range		ϑ_{Case}	0		+70	°C
Transceiver total Power Consumption		P_{TOT}		0.9	1.0	W
Power Supply Voltage @ 5.0V		V_{CC5}	4.75	5.00	5.25	V
Power Supply Voltage @ 3.3V		V_{CC3}	3.135	3.300	3.465	V
Supply Current for 5.0V	@ V_{CC5}	I_{VCC5}	-	3	10	mA
Supply Current for 3.3V	@ V_{CC3}	I_{VCC3}	210	242	285	mA

High Speed Line Characteristics

Parameter	Conditions	Symbol	Min	Typ	Max	Units
Baud Rate nominal	Depending on standard and provided reference clock		9.95		11.3	Gbd
Baud Rate Tolerance			-100		+100	ppm

High Speed Line Output - DC Characteristics

Parameter	Conditions	Symbol	Min	Typ	Max	Units
Single Ended Output Impedance		Z _{SE}	40	50	60	Ω
Differential Output Impedance		Z _{OD}	80	100	120	Ω

High Speed Line Output - AC Characteristics

Parameter	Conditions	Symbol	Min	Typ	Max	Units
Differential Output Amplitude		V _{OSPP}	340		850	mV
Output Common Mode		V _{CM}	0		3.6	V
Transition Time Low to High		t _r	24			ps
Transition Time High to Low		t _f	24			ps
Differential Output Return Loss	0.05 – 0.1GHz 0.1 – 5.5GHz 5.5 – 12GHz		20 8 see 1)			dB dB
Common Mode Output Return Loss ²⁾	0.1 – 15GHz	SCC 22	3			dB
Total Peak-to-Peak Jitter		D _j			0.34	UI
Output AC Common Mode Voltage					15	mV (RMS)

1) SDD22(dB) = 8 - 20.66 log₁₀(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.

High Speed Line Input - DC Characteristics

Parameter	Conditions	Symbol	Min	Typ	Max	Units
Differential Output Impedance		R _{IND}	80	100	120	Ω
Input AC Common Mode Input Voltage			0		25	mV (RMS)
Source to Sink DC Potential Difference		V _{CM}	0		3.6	V

High Speed Line Input - AC Characteristics

Parameter	Conditions	Symbol	Min	Typ	Max	Units
Differential Input Voltage Swing		V _{ID}	120 see 2)		820	mV
Differential Return Loss	0.05 – 0.1GHz 0.1 – 5.5GHz 5.5 – 12GHz	SDD11	20 8 see 1)			dB
Common Mode Return Loss	0.1 – 15GHz	SCC11	3			dB
Total Jitter		T _j			TBD	UI

1) SDD11(dB) = 8 - 20.66 log₁₀(f/5.5) with f in GHz

2) beneath this level the signal can't meet the specification

Optical Characteristics

General Parameters

Parameter	Conditions	Min Modal Bandwidth (MHz*km)	Symbol	Min	Typ	Max	Units
Operating Range	62.5 μm MMF	160	I _{OP}	2		26	m
	50 μm MMF	400		2		66	
	62.5 μm MMF	200		0.5		33	
	50 μm MMF	500		0.5		82	
	50 μm MMF	2000		0.5		300	
Nominal Signalling Speed	Depending on standard and provided reference clock		f _{OPT}	9.95		11.3	GBd

Optical Transmitter

Parameter	Conditions	Symbol	Min	Typ	Max	Units
Nominal Wavelength		λ _{TRP}	840	850	860	nm
Spectral Width		Δλ	0.1	0.2	0.44	nm
Average Launch Power		P _{opt, avg}	-2.9	-2.17	-1.45	dBm
Extinction Ratio		ER	4.9	6.35	7.21	dB
Relative Intensity Noise		RIN			-128	dB/Hz

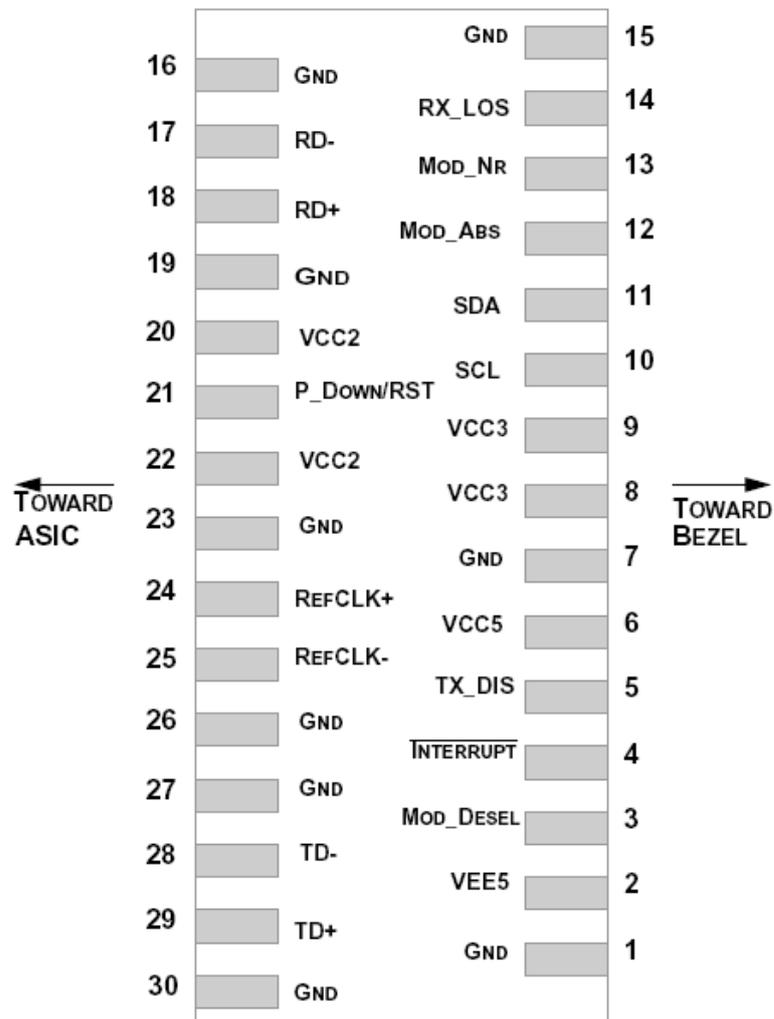
Optical Receiver

Parameter	Conditions	Symbol	Min	Typ	Max	Units
Center Wavelength		λ _C	840	850	860	nm
Receiver Sensitivity	in OMA, BER 10 ⁻¹² @ 2 ³¹ -1 ¹⁾	P _{IN}	-15.1	-13.5	-11.1	dBm
Stressed Receiver Sensitivity	in OMA	P _{IN}	-13.7	-11.8	-7.5	dBm
Saturation Input Power		P _{SAT}			+1	dBm

¹⁾ with ideal transmitter

Note: The specified characteristics are met within the recommended range of operating conditions and under the default settings of output power and modulation amplitude. A change in setting of the optical output power influences especially the dynamic behavior of the output signal. Unless otherwise noted typical data are quoted at nominal voltages and +25°C ambient temperature.

Hostboard Connector Pinout



Top View

Electrical Pin Definition

PIN	Logic	Symbol	Name / Description	Note
1		GND	Module Ground	1
2		VEE5	Optional -5.2V Power Supply	
3	LVTTL-I	Mod_DeSel	Mode De-select; When held low allows module to respond to 2-wire serial interface commands	
4	LVTTL-O	Interrupt	Interrupt (inverted); Indicates presence of an important condition which can be read over the 2-wire serial interface	2
5	LVTTL-I	TX_DS	Transmitter Disable; Turns off transmitter laser output	
6		VCC5	+5V Power Supply	
7		GND	Module Ground	1
8		VCC3	+3.3V Power Supply	
9		VCC3	+3.3V Power Supply	
10	LVTTL-I/O	SCL	2-Wire Serial Interface Clock	2
11	LVTTL-I/O	SDA	2-Wire Serial Interface Data Line	2
12	LVTTL-O	Mod_Abs	Indicates Module is not present. Grounded in the module	2
13	LVTTL-O	Mod_NR	Module Not Ready; Indicating module operational fault	2
14	LVTTL-O	RX_LOS	Receiver Loss Of Signal Indicator	2
15		GND	Module Ground	1
16		GND	Module Ground	1
17	CML-O	RD-	Receiver Inverted Data Output	
18	CML-O	RD+	Receiver Non-Inverted Data Output	
19		GND	Module Ground	1
20		VCC2	+1.8V Power Supply (not required by TRX10GDP)	
21	LVTTL-O	P_Down/RST	Power down; When high, requires the module to limit power consumption to 1.5W or below. 2-Wire serial interface must be functional in the low power mode. Reset; The falling edge initiates a complete reset of the module including the 2-wire serial interface, equivalent to a power cycle.	
22		VCC2	+1.8V Power Supply (not required by TRX10GDP)	
23		GND	Module Ground	1
24	PECL-I	RefCLK+	Reference Clock Non-Inverted Input, AC coupled on the host board	
25	PECL-I	RefCLK-	Reference Clock Inverted Input, AC coupled on the host board	
26		GND	Module Ground	1
27		GND	Module Ground	1
28	CML-I	TD-	Transmitter Inverted Data Input	
29	CML-I	TD+	Transmitter Non-Inverted Data Input	
30		GND	Module Ground	1

- 1) Module ground pins GND are isolated from the module case and chassis ground within the module.
- 2) Shall be pulled up with 4.7K Ω -10K Ω to a voltage between 3.15V and 3.45V on the host board.

Electro Static Discharge (ESD)

The maximum electrostatic charge based on a human body model and the conditions as outlined below is:

<i>Parameter</i>	<i>Conditions</i>	<i>Symbol</i>	<i>Min</i>	<i>Typ</i>	<i>Max</i>	<i>Units</i>
On XFI High Speed Pins	JEDEC JESD22-A114-B				500	V
On XFI Pins excluding High Speed Pins	JEDEC JESD22-A114-B				2,000	V
On XFP Module	Air Discharge EN61000-4-2 criterion B				15,000	V
On XFP Module	Direct Contact Discharge EN61000-4-2 criterion B				8,000	V

Thermal Management

The transceiver is designed for an operation within a case temperature range between 0 to +70°C at an altitude of < 3km. The user needs to guarantee per system design to not exceed this temperature range. It has to be considered that in case of use of multiple modules on a single hostboard there is a temperature rise among the modules hosted side by side. Airflow direction and air speed needs to be chosen accordingly.

Eye Safety

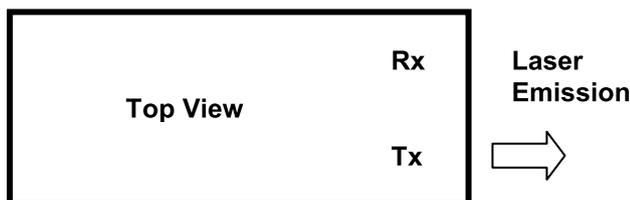
This laser based multimode transceiver is a Class 1 product. It complies with IEC 60825-1 Ed.2: 2007 and FDA performance standards for laser products (21 CFR 1040.10 and 1040.11) except for deviations pursuant to Laser Notice 50, dated June 24, 2007.

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)).

Laser Emission Data



Wavelength	850 nm
Accessible Emission Limit (as defined by IEC: 7 mm aperture at 100 mm distance)	771 μ W/ -1.13dBm
Beam divergence (full angle) / NA (half angle)	20° / 0.18rad

Required Labeling

FDA

Compliant to 21 CFR
 1040.10 and 1040.11

IEC

Class 1M Laser Product

Ordering Information

Standard	Description	Nominal Baud Rate	Unit	Partnumber
IEEE 802.3ae-2002	10 GBASE-SR	10,3125	GBd	TRX10GVP2001
1200-Mxx-SN-I	10G Fibre Channel	10,51875	GBd	TRX10GVP2001

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More information about FCI's complete range of High Speed Input/Output products can be found on www.fciconnect.com/hsio

For more information about e-catalog or FCI sales offices, headquarters, agents and local distributors, visit www.fciconnect.com



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