

FOCUS-8596-02

XFP-10GB-SR Transceiver

Features

- ◆ 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 10.51875Gbit/s
- ◆ Transmission distance up to
82m(50µm MMF) or 300m(high
bandwidth MMF;2000MHz*Km)
- ◆ Low power consumption 1.5W(typ.)
- ◆ Wide operating temperature
range:0°C to +70°C
- ◆ Laser Class 1M compliant
- ◆ Vertical Cavity Surface Emitting
Laser at 850nm(VCSEL)
- ◆ LC duplex connector
- ◆ XFI loopback supported
- ◆ Lead free and RoHS Compliant
- ◆ Excellent EMI performance
- ◆ High reliability

General Description and Applications

The FOCUS-8596-02 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 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 Fiber Channel	10.51875	GBd

Electrical Characteristics

Absolute Maximum Ratings

Rating	Conditions	Symbol	Min	Max	Units
Storage Ambient Temperature Range			-40	+85	°C
Powered case Temperature Range			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	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

Recommend operating condition

Parameter	Conditions	Symbol	Min	Typ	Max	Units
Operating Case Temperature Range			0		+70	°C
Transceiver total Power Consumption		P_{TOT}		1.5	2.3	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	@ V_{CC5}	I_{VCC5}		50	100	mA
Supply Current	@ V_{CC3}	I_{VCC3}		325	500	mA

High Speed Line Characteristics

Parameter	Conditions	Symbol	Min	Typ	Max	Units
Baud Rate nominal			9.95		10.71	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 See1)			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) $SDD22(dB)=8-20.66 \log_{10}(f/15.5)$ 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)			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) $SDD11(dB)=8-20.66 \log_{10}(f/15.5)$ with f in GHz
- 2) Beneath this level the signal can't meet the specification

Optical Characteristics

General parameters

Optical Transmitter

Parameter	Conditions	Symbol	Min	Typ	Max	Units
Nominal Wavelength		λ_{TRP}	840	850	860	nm
Spectral Width		$\Delta \lambda$		0.4	0.45	nm

Parameter	Conditions	Min Modal Bandwidth (MHz*Km)	Symbol	Min	Typ	Max	Units
Operating Range	62.5/125 μ m MMF						m
	50/125 μ m MMF	160	I_{OP}	2		26	
	62.5/125 μ m MMF	400		2		66	
	50/125 μ m MMF	200		2		33	
	50/125 μ m MMF	500		2		82	
	50/125 μ m MMF	2000		2		300	
Nominal Signalling Speed			f_{OPT}	9.95		10.71	GBd
Launch Power	in OMA		P_{optOMA}	-4.3			dBm
Average Launch Power			P_{optavg}	-7.3	-2.6	-1	dBm
Extinction Ratio			ER	3.5	5.5		dB
Relative Intensity Noise			RIN			-128	dB/Hz

Optical Receiver

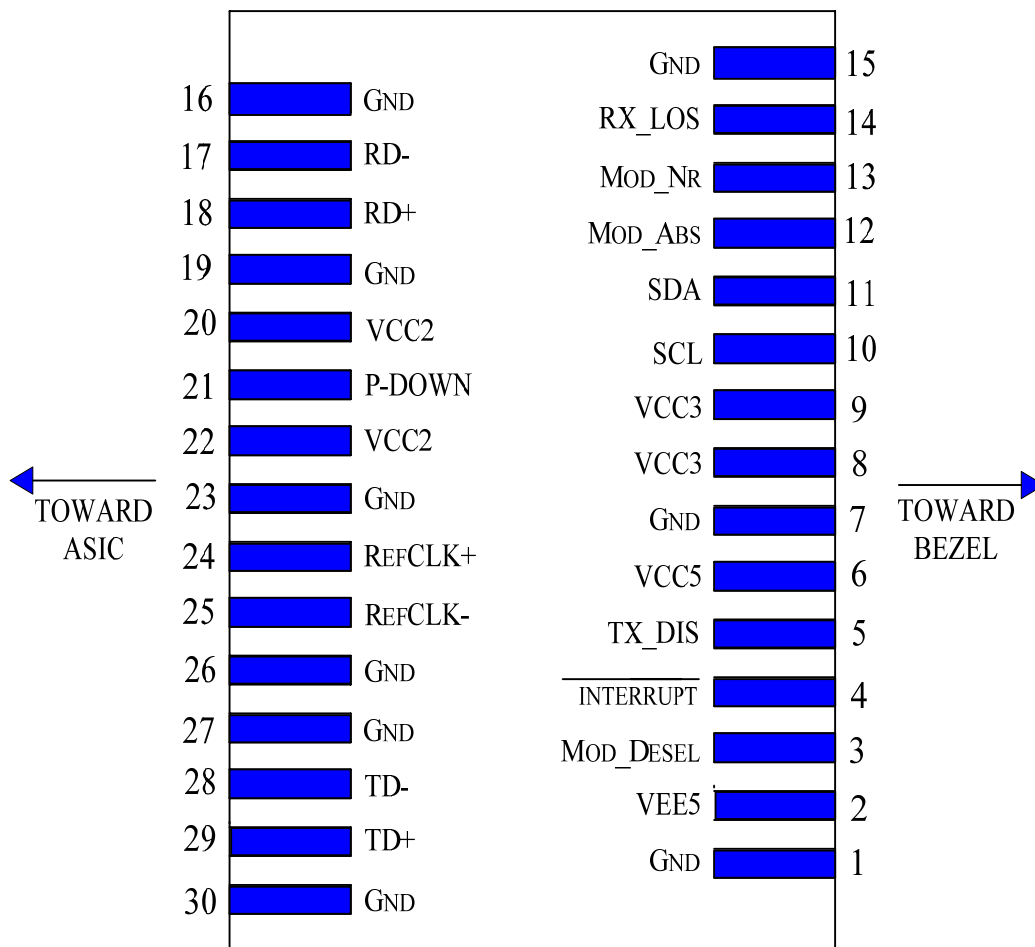
Parameter	Conditions	Symbol	Min	Typ	Max	Units
Center Wavelength		λ_C	840	850	860	nm
Receiver Sensitivity	in OMA, BER	P_{IN}		-13.5	-11.1	dBm

	10^{-12} @ 2^{31} - 1 ¹⁾					
Stressed Receiver Sensitivity	in OMA	P_{IN}			-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 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	
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	
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 $4.7k\ \Omega$ - $10\ k\ \Omega$ to a voltage between $3.15V$ and $3.45V$ on the host board.

Digital Diagnostic Functions

FOCUS-8596-02 Small Form Factor 10Gb/s (XFP) transceivers are compliant with the current XFP Multi-Source Agreement (MSA) Specification Rev 4.5.

As defined by the XFP MSA, Focus XFP transceivers provide digital diagnostic functions via a 2-wire serial interface, which allows real-time access to the following operating parameters:

- ◆ Transceiver temperature
- ◆ Laser bias current
- ◆ Transmitted optical power
- ◆ Received optical power
- ◆ Transceiver supply voltage

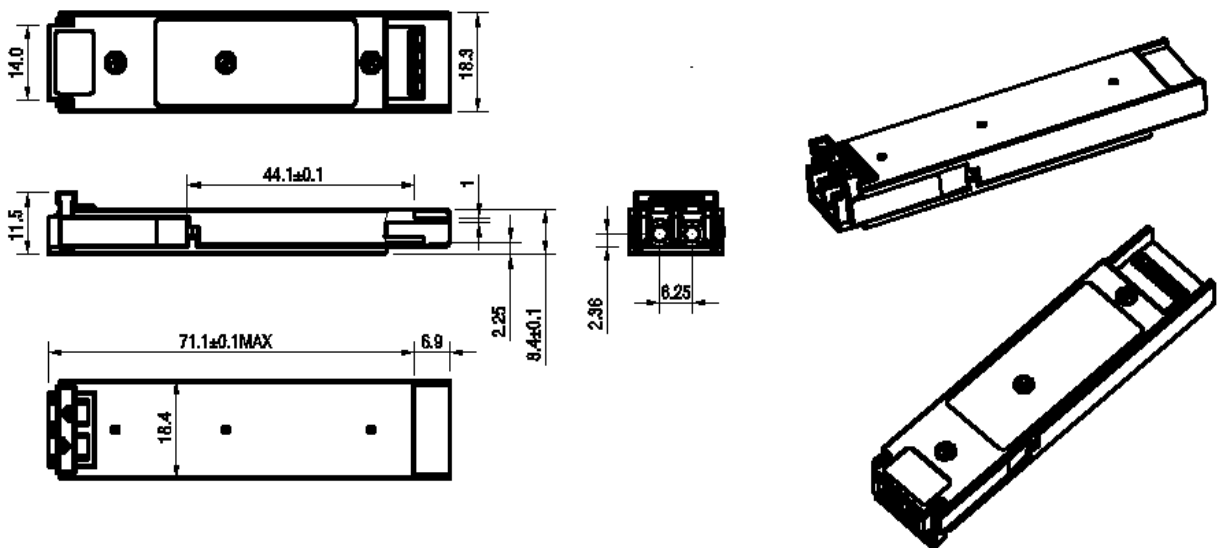
It also provides a sophisticated system of alarm and warning flags, which may be used to alert end-users when particular operating parameters are outside of a factory-set normal range.

The operating and diagnostics information is monitored and reported by a Digital Diagnostics Transceiver Controller inside the transceiver, which is accessed through the 2-wire serial interface. When the serial protocol is activated, the serial clock signal (SCL pin) is generated by the host. The positive edge clocks data into the XFP transceiver into those segments of its memory map that are not write-protected. The negative edge clocks data from the XFP transceiver. The serial data signal (SDA pin) 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

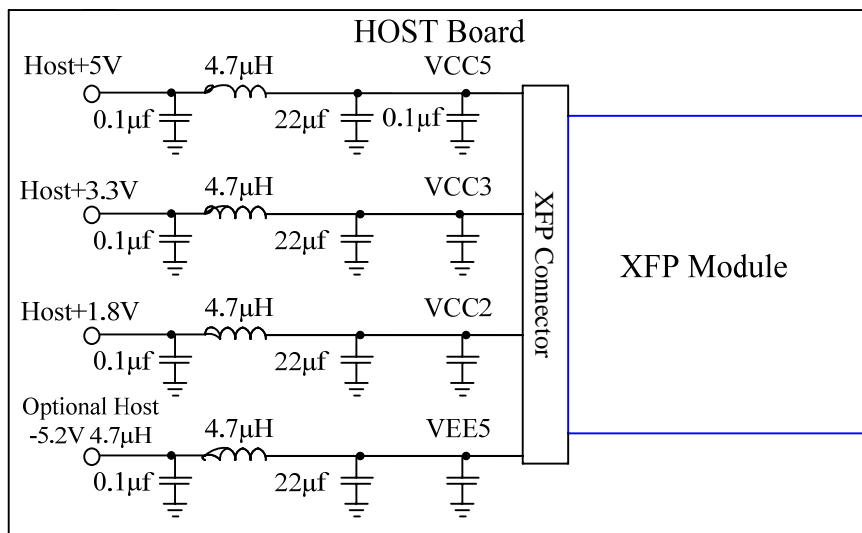
individually or sequentially. The 2-wire serial interface provides sequential or random access to the 8 bit parameters, addressed from 000h to the maximum address of the memory.

Mechanical Specifications

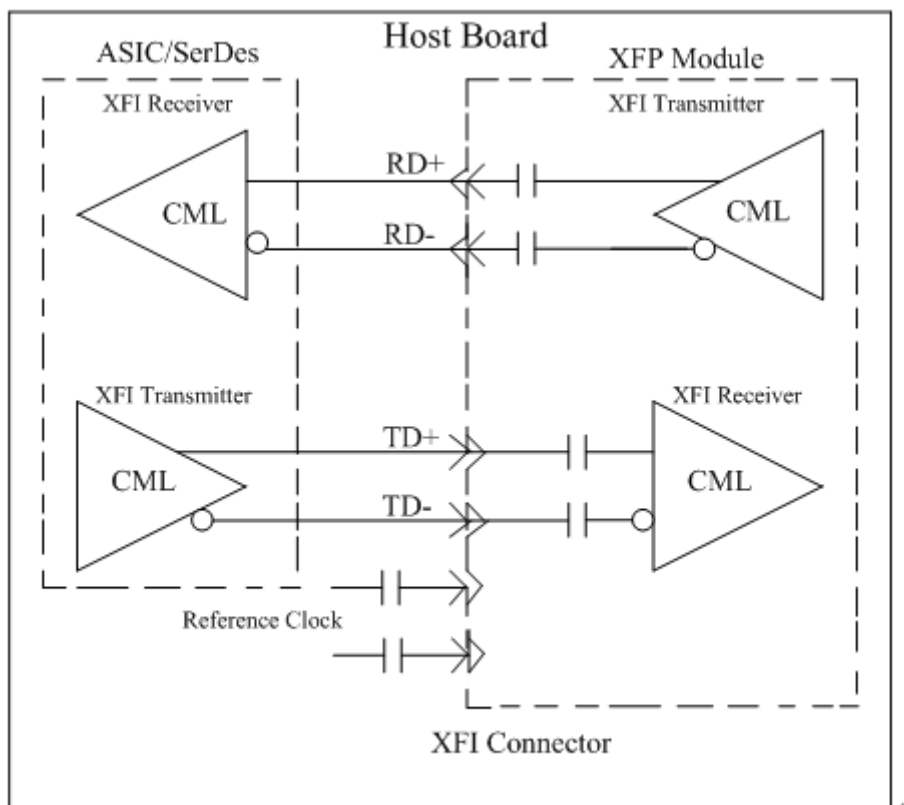
Focus XFP transceivers are compliant with the dimensions defined by the XFP Multi-Sourcing Agreement (MSA).



Recommended Host Board Power Supply Circuit



Recommended High-speed Interface Circuit



Ordering information

Part No.	Data Rate	Laser	Fiber Type	Distance	Optical Interface
FOCUS-8596-02	10G	VCSEL	MMF	300m	LC

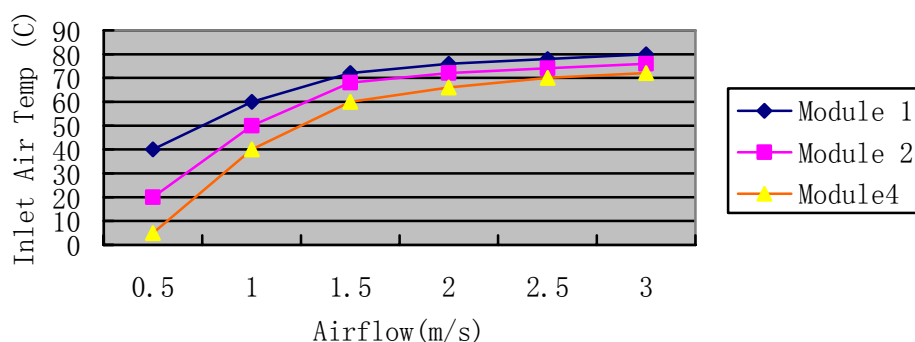
Thermal Management

The transceiver is designed for operation within a 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 (see figure below). Airflow direction and air speed needs to be chosen accordingly.

For further information it is referred to the MSA document

Example of Module Temperature vs Air Flow

**Figure 1 Thermal behaviour of multiple modules vs. Inlet Air Temperature**

Eye Safety

This laser based multimode transceiver is a Class 1M product. It complies with IEC 60825-1 and FDA performance standards for laser products (21 CFR 1040.10 and 1040.11) except for deviations pursuant to laser Notice 50, dated July 26, 2001.

CLASS 1M LASER PRODUCT

DO NOT VIEW DIRECTLY WITH OPTICAL INSTRUMENTS

To meet laser safety requirements the transceiver shall be operated within Absolute Maximum Ratings.

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(1)).

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