

10Gbps 40Km XFP 1550nm Transceivers FPSXP5510GL-40D

Features

- Compliant to INF-8077-XFP MSA REV.4.5
- Data Rate from 9.95 Gbps to 11.3Gbps
- Cooled 1550nm EML Transmitter, PIN Photodiode and TIA
- SM 9/125um up to 40Km
- Duplex LC connector
- Built-in digital diagnostic monitoring functions
- All-Metal housing for superior EMI Performance
- Power dissipation < 3.5W, 3.3V and 5V power supply
- Operating Case Temperature Standard: 0°C~+70°C
- Protocol-independent, XFI Interface
- Hot Pluggable
- ROHS6 Compliant

Applications

- SONET OC-192 SR-1&SDH STM I-64.1
- 10GBASE-LR/LW 10Gigabit Ethernet
- 10G Fiber Channel

PRODUCT DESCRIPTION

FPSXP5510GL-40D is hot pluggable Small-Form-Factor transceiver module. It designed expressly for high-speed communication applications that require rates up to 11.3Gb/s, it designed to be compliant with XFP MSA. The module data link up to 40Km in 9/125um single mode fiber. The optical output can be disabled by a LVTTTL logic high-level input of Tx Disable. Loss of signal (LOS) output is provided to indicate the loss of an input optical signal of receiver or the link status with partner.

Absolute Maximum Ratings

Parameter	Symbol	Min.	Typ.	Max.	Unit
Storage Temperature	Ts	-40		85	°C
Operating Case Temperature	Tc	0		70	°C
Storage Ambient Humidity	HA	5		90	%
Operating Relative Humidity	RH			85	%
Supply Voltage 1	VCC3	-0.3		4	V
Supply Voltage 2	VCC5	-0.5		6	V

Recommended Operating Conditions

Parameter	Symbol	Min.	Typ.	Max.	Unit
Ambient Operating Temperature	T _A	0		70	°C
Supply Voltage1	VCC3	3.15	3.3	3.45	V
Supply Voltage2	VCC5	4.75	5.0	5.25	V
Supply Current1	ICC3			750	mA
Supply Current2	ICC5			500	mA
Power Dissipation				3.5	W
Data Rate	BR	9.95	10.3	11.3	Gbps
Transmission Distance	TD			40	Km

Electrical Characteristics

Parameter	Symbol	Min.	Typ.	Max.	Unit	Notes
Transmitter						
Input differential impedance	R _i		100		Ω	1
Differential data input swing	V _{in,pp}	120		1000	mV	
Transmit disable voltage	V _D	2		VCC3	V	
Transmit enable voltage	V _{EN}	V _{ee}		V _{ee} +0.8	V	
Data dependent input jitter	DDJ			0.1	U	
Data input Total Jitter	TJ			0.28	U	
Receiver						
Differential data output swing	V _{out,pp}	400		800	mV	
Data output rise time,fall time	t _r	24			P	2
Los Fault	V _{LOS} fault	2		VCC3 _{host}	V	3
Los Normal	V _{LOS}	V _{ee}		V _{ee} +0.8	V	3
Total Jitter	TJ			0.70	U	
Deterministic Jitter	DJ			0.42	U	

Notes:

1. Connected directly to TX data input pins, AC coupling from pins into laser drive
2. 20 – 80 % . Measured with Module Compliance Test Board and OMA test pattern. Use of four 1's and four 0's in sequence in the PRBS⁹ is an acceptable alternative.
3. LOS is an open collector output. Should be pulled up with 4.7kΩ – 10kΩ on the host board. Normal operation is logic 0; loss of signal is logic 1. Maximum pull-up voltage is 3.6V

Optical Characteristics

Parameter	Symbol	Min.	Typ.	Max.	Unit	Notes
Transmitter						
Center Wavelength	λ_t	1530	1550	1565	nm	
Average Optical Power	P_{av}	-3		5	dBm	
Extinction Ratio	ER	8.2			dB	
Spectral width(-20dB)				0.4	nm	
Eye diagram	Compliant with ITU-T G.691 eye mask and IEEE802.3ae eye mask					
Transmitter and Dispersion Penalty				2	dB	9.95 Gbps
Transmitter and Dispersion Penalty				3	dB	10.7 Gbps
Relative Intensity Noise	RIN			-128	dB/Hz	
Receiver						
Center Wavelength	λ_R	1260	1310	1560	nm	
Receiver Sensitivity At 9.95Gbps				-15	dBm	1
Receiver Sensitivity At 10.7Gbps				-15	dBm	1
Return Loss Tolerance				-12	dB	
Receiver Overload	RPmax	0.8			dBm	2
LOS De-Assert	LOS _D			-19	dBm	
LOS Assert	LOS _A	-34			dBm	
LOS Hysteresis		0.5		6	dB	
LOS	High		2.0	VCC3+0.3	V	
	Low		0	0.8		

Notes:

1. Measured with a PRBS $2^{31}-1$ test pattern, ER=10,BER $\leq 10^{-12}$
2. Receiver Overload specified in OMA and under the worst comprehensive stressed conditions

Pin function definitions

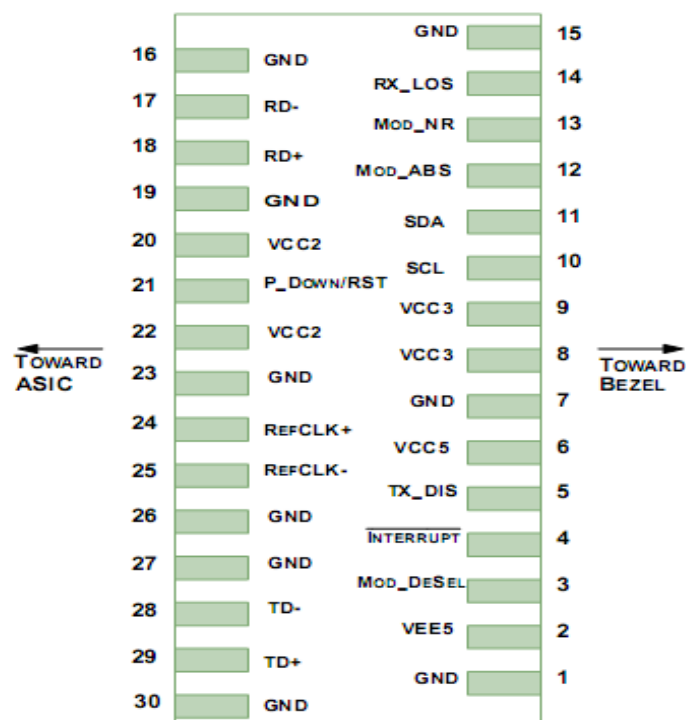


Figure 1 Host PCB XFP Pinout Top View

Pin	Logic	Symbol	Name/Description	Ref
1		GND	Module Ground	1
2		VEE5	Optional –5.2V Power Supply – Not required	
3	LVTTL-I	Mod-Desel	Module De-select; When held low allows the module to respond to 2-wire serial interface commands	
4	LVTTL-O	Interrupt	Interrupt (bar); Indicates presence of an important condition which can be read over the serial 2-wire interface	2
5	LVTTL-I	TX_DIS	Transmitter Disable; Transmitter laser source turned off	
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	SCL	Serial 2-wire interface clock	2
11	LVTTLI/O	SDA	Serial 2-wire interface data line	2
12	LVTTL-O	Mod_Abs	Module Absent; Indicates module is not present. Grounded in the module.	2
13	LVTTL-O	Mod_NR	Module Not Ready	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	
21	LVTTL-I	P_Down/RS T	Power Down; When high, places the module in the low power stand-by mode and on the falling edge of P_Down initiates a module reset	
			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	
23		GND	Module Ground	1
24	PECL-I	RefCLK+	Reference Clock non-inverted input, AC coupled on the host board – Not required	3
25	PECL-I	RefCLK-	Reference Clock inverted input, AC coupled on the host board – Not required	3
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

Notes:

1. Module circuit ground is isolated from module chassis ground within the module.
2. Open collector; should be pulled up with 4.7k – 10kohms on host board to a voltage between 3.15V and 3.6V.
3. A Reference Clock input is not required by the FPSXP5510GL-40D.

Recommended Block Circuit

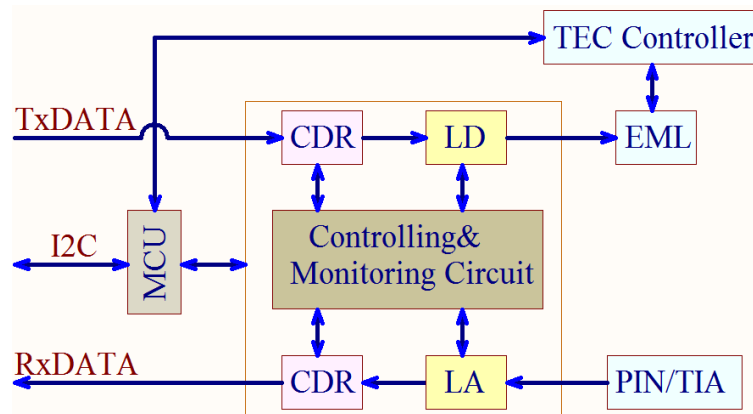


Figure 2 Block Diagram

Typical application circuit

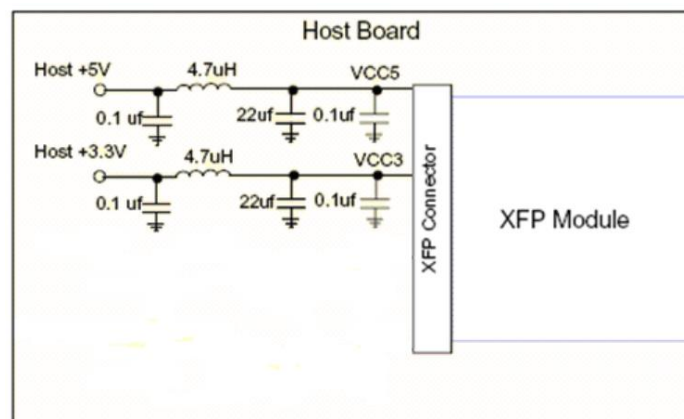


Figure 3 Example of Host Board Supply Filtering Network

Recommended High-speed Interface Circuit

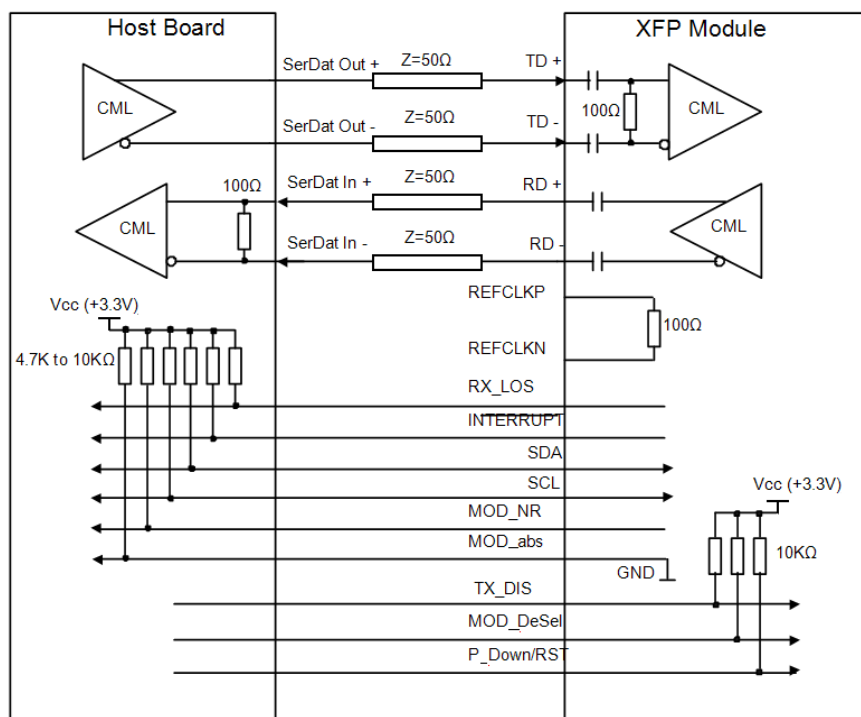


Figure 4 Example of High-speed Interface Circuit

Digital Diagnostic Functions

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

- Transceiver Temperature
- Tx Bias Current
- Tx Optical Power
- RX Received Optical Power
- Transceiver +3.3V 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.

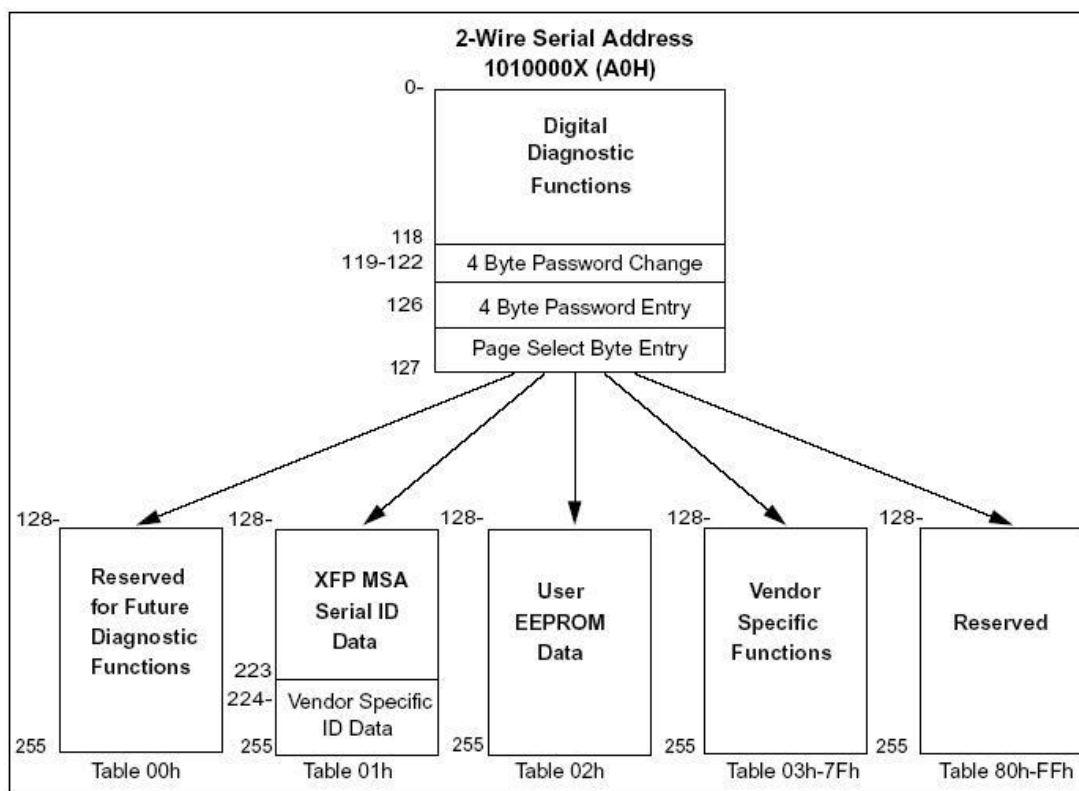
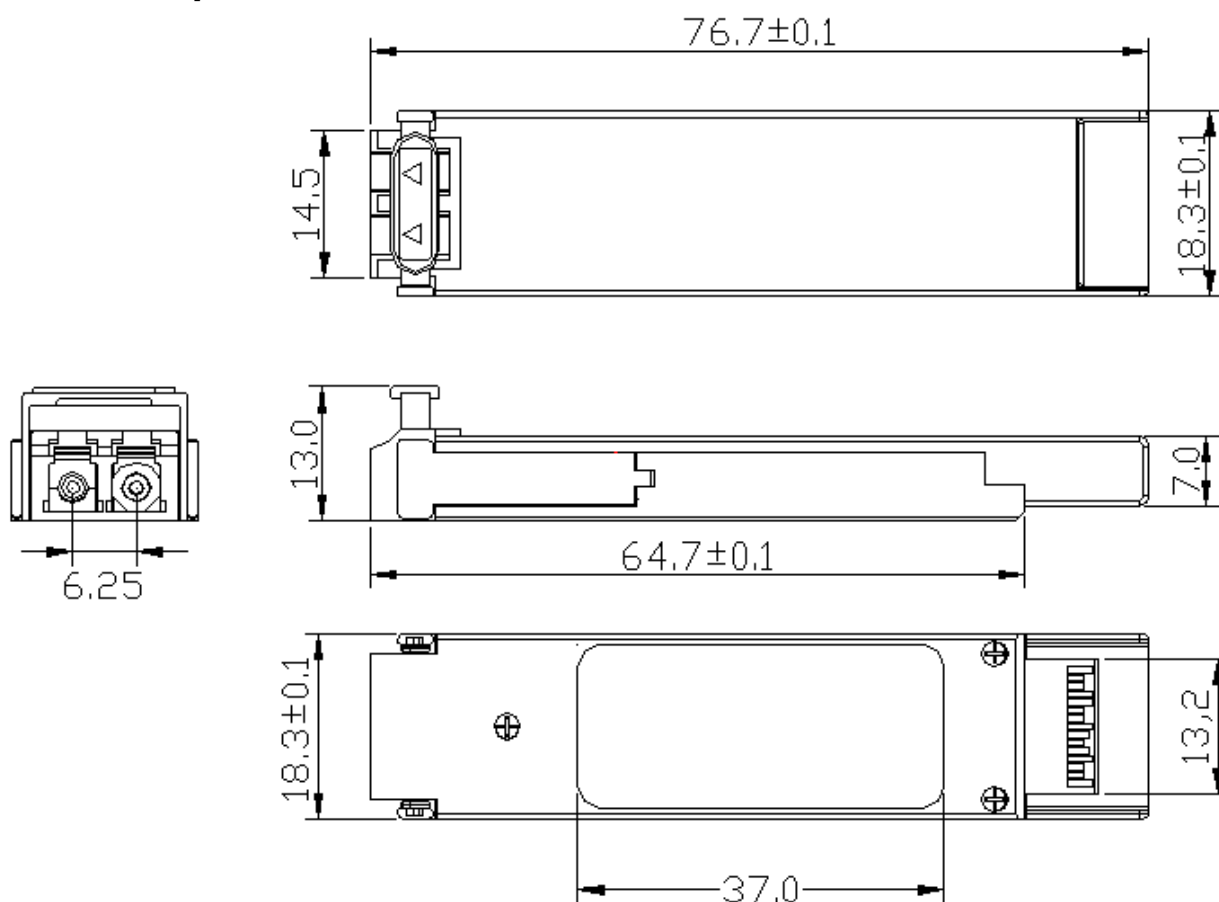


Figure 5 wire Serial Digital Diagnostic Memory Map

Mechanical Specifications



ESD

This transceiver is specified as ESD threshold 2kV for all electrical input pins, tested per MIL-STD-883, Method 3015.4 /JESD22-A114-A (HBM). However, normal ESD precautions are still required during the handling of this module. This transceiver is shipped in ESD protective packaging. It should be removed from the packaging and handled only in an ESD protected environment.

Ordering information

Part No.	Data Rate	Laser	Receiver	Distance	Interface	DDM	Temp.
FPSXP5510GL-40D	10Gbps	EML	PIN-TIA	40Km	LC	YES	C

* 40D--- 40Km with SM 9/125um Fiber Transmission, with DDM/DOM Functional