

XP-85B1-02D-5

32G FC 850nm Multi-mode SFP28 Transceiver

PRODUCT FEATURES

- Up to 28.05Gbps Data Links
- Maximum link length of 70m links on OM3 or 100m links on OM4 multimode fiber
- Power dissipation < 1W
- VSCSEL laser and PIN receiver
- Metal enclosure, for lower EMI
- 2-wire interface with integrated Digital Diagnostic monitoring
- Compliant with FC-PI-6.
- Hot-pluggable SFP+ footprint
- Specifications compliant with SFF 8472
- Compliant with SFP+ MSA with LC connector
- Single 3.3V power supply
- Case operating temperature range: Commercial: 0 °C to +70 °C;



APPLICATIONS

- Tri-Rate 8G FC, 16G FC and 32G FC.

STANDARD

- Compliant to SFF-8431
- Compliant to SFF 8472

- RoHS Compliant.
- Compliant with FC-PI-6.

I. Absolute Maximum Ratings

Parameter	Symbol	Min.	Typ.	Max.	Unit	Note
Storage Temperature	Ts	-40	-	85	°C	
Relative Humidity	RH	5	-	95	%	
Power Supply Voltage	VCC	-0.5	-	4.0	V	
Signal Input Voltage		Vcc-0.3	-	Vcc+0.3	V	

II. Recommended Operating Conditions

Parameter	Symbol	Min.	Typ.	Max.	Unit	Note
Case Operating Temperature	Tcase	0	-	70	°C	Commercial
Power Supply Voltage	VCC	3.14	3.30	3.47	V	
Power Supply Current	ICC	-		300	mA	
Data Rate	BR		8.5 14.025 28.05		Gbps	1
Bit Error Rate	BER			10 ⁻¹² 10 ⁻⁶	Gbps	2,3
Transmission Distance	TD		-	100	m	OM4 or 70m OM3
Coupled fiber		Multi mode fiber				

Notes:

1. 8x Fibre Channel compatible, per FC-PI-41.
2. PRBS 2⁷-1 for 8GFC. PRBS 2³¹-1 for 16GFC
3. FEC for 32GFC

III. Optical Characteristics

Parameter	Symbol	Min	Typ	Max	Unit	Ref.
Transmitter						
Average Output Power: 50 or 62.5MMF 8.5Gb/s 14.025Gb/s 28.05Gb/s	P _{OUT}	-8.2 -7.8 -6.7		2.4	dBm	1
Optical Wavelength	λ	840	850	860	nm	
Spectral Width (RMS), 28.05Gb/s	σ			0.57	nm	
Optical Modulation Amplitude 8.5 Gb/s 14.025Gb/s 28.05Gb/s	OMA	-5.2 -4.8 -3.2			dBm	
Transmitter Waveform and Dispersion Penalty, 8.5Gb/s	TWDP			4.3	dB	2

Vertical Eye Closure Penalty 14.025 Gb/s 28.05 Gb/s	VECPQ			2.56 3.13	dB	3,4
Optical Extinction Ratio	ER	3.0			dB	
Relative Intensity Noise 28.05Gb/s 14.025Gb/s & 8.5Gb/s	RIN			-129 -128	dB/Hz	
Receiver						
Unstressed Receiver OMA Sensitivity 8.5 Gb/s 14.025Gb/s 28.05Gb/s	RSENS			-11.2 -10.5 -10.2	dBm	5,6
Input Saturation Power (Overload)	Psat	2.0			dBm	
Wavelength Range	λ_c	770	850	860	nm	
Optical Return Loss		12			dB	
LOS De -Assert	LOSD			-12	dBm	
LOS Assert	LOSA	-30			dBm	
LOS Hysteresis		0.5			dB	

Notes:

- Class 1 Laser Safety limit per FDA/CDRH, and EN (IEC) 60825 laser safety standards.
- TWDP is calculated with a 1,0 equalizer and a 9.84 GHz Gaussian filter for the fiber simulation. Jitter values at γ_T and γ_R are controlled by TWDP and stress receiver sensitivity.
- For 16GFC, VECPQ is calculated with a 16.6 GHz Gaussian filter for fiber simulation.
- For 32GC, VECPQ is calculated with a 24.7GHz Gaussian filter for fiber simulation.
- Unstressed Rx sensitivity.
- For 32GFC with FEC, receiver sensitivity is defined at 10^{-6} BER level, not 10^{-12} BER level.

IV. Electrical Characteristics

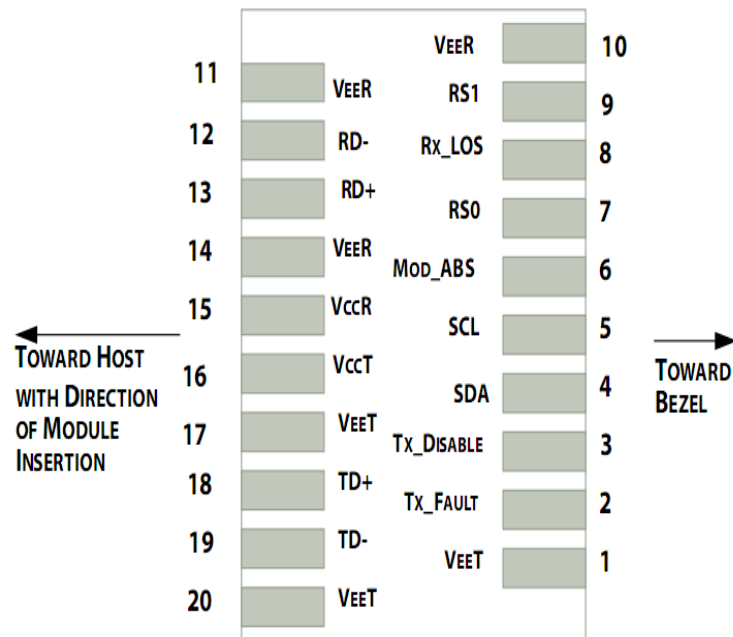
Parameter	Symbol	Min	Typ	Max	Unit	NOTE
Supply Voltage	Vcc	3.14	3.3	3.46	V	
Supply Current	Icc			300	mA	1
Transmitter						
Input differential impedance	Rin		100		Ω	2
Differential data input eye height 28.05Gb/s 14.025Gb/s & 8.5Gb/s	Vin,pp	80 180		900 700	mV	2
Transmit Disable Voltage	VD	Vcc-1.3		Vcc	V	3
Transmit Enable Voltage	VEN	Vee		Vee+ 0.8	V	
Receiver						

Differential data output swing	Vout,pp	300		850	mV	4
LOS Fault	VLOS fault	Vcc-1.3		VccHOST	V	5
LOS Normal	VLOS norm	Vee		Vee+0.8	V	5

Notes:

1. With established link. The total power dissipation could exceed 1W when the module is trying to establish link at operating case temperature below 25° C
2. Connected directly to TX data input pins. AC coupling from pins into CDR, Inner eye height (EH6) for high loss case , BER contour 10-6, per FC-PI 6 and FC-MSQS-2.
3. Or open circuit.
4. Into 100 ohms differential termination.
5. LOS is an open collector output. Should be pulled up with 4.7k – 10kohms on the host board. Normal operation is logic 0; loss of signal is logic 1. Maximum pull-up voltage is 5.5V.

V. Pin Descriptions



Pin out of Connector Block on Host Board

Pin	Symbol	Name/Description	NOTE
1	V _{EET}	Transmitter Ground (Common with Receiver Ground)	1
2	Tx_Fault	Transmitter Fault.	2
3	Tx_Disable	Transmitter Disable. Laser output disabled on high or open.	3
4	SDA	2-wire Serial Interface Data Line	4

5	SCL	2-wire Serial Interface Clock Line	4
6	MOD_ABS	Module Absent. Grounded within the module	4
7	RS0	Rx Rate Select: Open or Low = 8.5 or 14.025 Gb/s Fibre Channel (Low Bandwidth) High = 28.05 Gb/s Fibre Channel (High Bandwidth)	5
8	Rx_LOS	Loss of Signal indication. Logic 0 indicates normal operation.	6
9	RS1	Tx Rate Select: Open or Low = 8.5 or 14.025 Gb/s Fibre Channel (Low Bandwidth) High = 28.05 Gb/s Fibre Channel (High Bandwidth)	5
10	V _{EER}	Receiver Ground (Common with Transmitter Ground)	1
11	V _{EER}	Receiver Ground (Common with Transmitter Ground)	1
12	RD-	Receiver Inverted DATA out.	
13	RD+	Receiver Non-inverted DATA out.	
14	V _{EER}	Receiver Ground (Common with Transmitter Ground)	1
15	V _{CCR}	Receiver Power Supply	
16	V _{CCT}	Transmitter Power Supply	
17	V _{EET}	Transmitter Ground (Common with Receiver Ground)	1
18	TD+	Transmitter Non-Inverted DATA in.	
19	TD-	Transmitter Inverted DATA in.	
20	V _{EET}	Transmitter Ground (Common with Receiver Ground)	1

Notes:

1. Circuit ground is internally isolated from chassis ground.
2. T_{FAULT} is an open collector/drain output, which should be pulled up with a 4.7kΩ– 10 kΩ resistor on the host board if intended for use. Pull up voltage should be between 2.0V to V_{cc} + 0.3V. A high output indicates a transmitter fault caused by either the TX bias current or the TX output power exceeding the preset alarm thresholds. A low output indicates normal operation. In the low state, the output is pulled to <0.8V.
3. Laser output disabled on T_{DIS} >2.0V or open, enabled on T_{DIS} <0.8V.
4. Should be pulled up with 4.7kΩ- 10kΩ on host board to a voltage between 2.0V and 3.6V. MOD_ABS pulls line low to indicate module is plugged in.
5. Rate select can also be set through the 2-wire bus in accordance with SFF-8472 v. 12.1c. Rx Rate Select is set at Bit 3, Byte 110, Address A2h. Tx Rate Select is set at Bit 3, Byte 118, Address A2h. Note: writing a “1” selects maximum bandwidth operation. Rate select is the logic OR of the input state of Rate Select Pin and 2-wire bus.
6. LOS is open collector output. It should be pulled up with 4.7kΩ – 10kΩ on host board to a voltage between 2.0V and 3.6V. Logic 0 indicates normal operation; logic 1 indicates loss of signal.

VI. Digital Diagnostic Functions

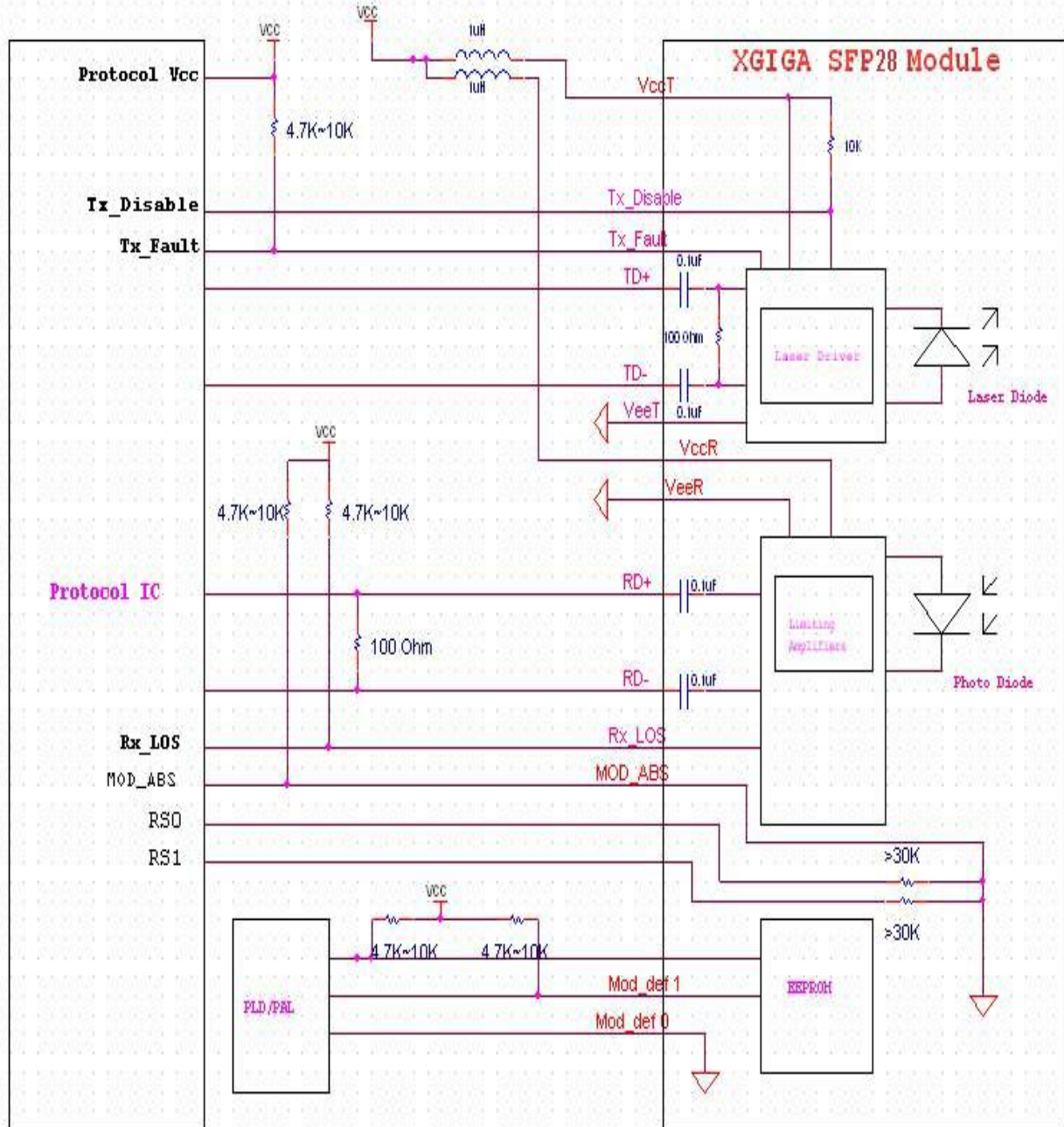
XGIGA XP-85B1-02D-5 transceivers support the 2-wire serial communication protocol as defined in the SFP+ MSA. The standard SFP serial ID provides access to identification information that describes the transceiver's capabilities, standard interfaces, manufacturer, and other information.

Additionally, XGIGA SFP+ transceivers provide a unique enhanced digital diagnostic monitoring interface, which allows real-time access to device operating parameters such as transceiver temperature, laser bias current, transmitted optical power, received optical power and transceiver supply voltage. It also defines a sophisticated system of alarm and warning flags, which alerts end-users when particular operating parameters are outside of a factory set normal range.

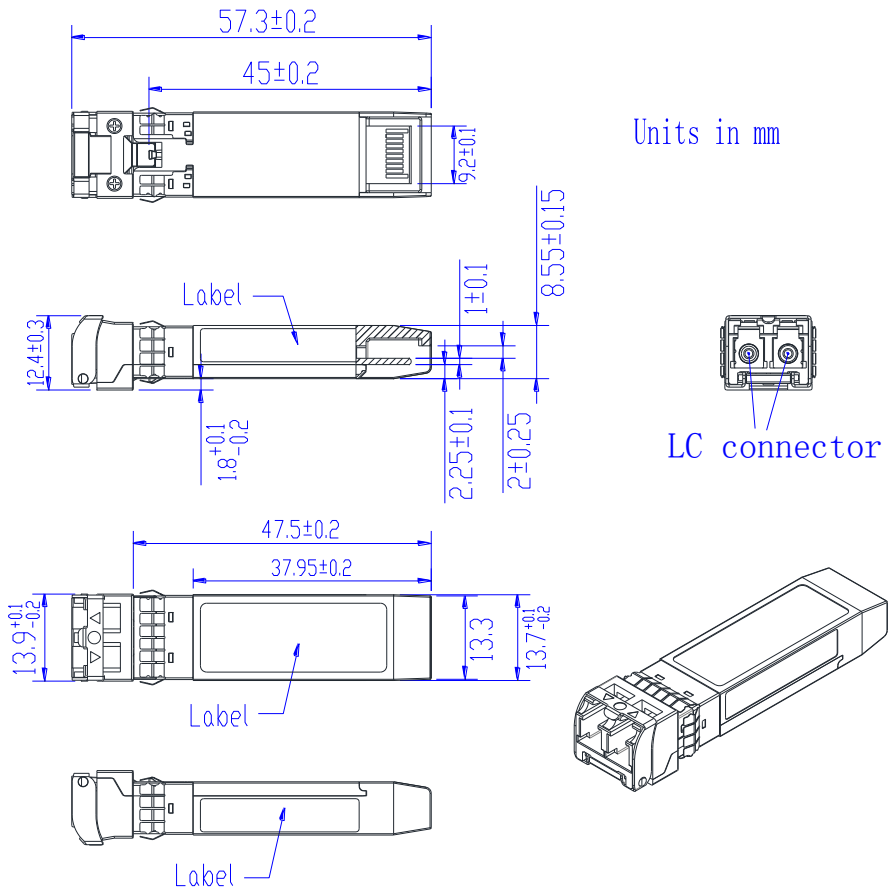
The SFP+ MSA defines a 256-byte memory map in EEPROM that is accessible over a 2-wire serial interface at the 8 bit address 1010000X (A0h). The digital diagnostic monitoring interface makes use of the 8 bit address 1010001X (A2h), so the originally defined serial ID memory map remains unchanged.

The operating and diagnostics information is monitored and reported by a Digital Diagnostics Transceiver Controller (DDTC) inside the transceiver, which is accessed through a 2-wire serial interface. 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 the SFP transceiver into those segments of the E2PROM 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.

VII. Host - Transceiver Interface Block Diagram



VIII. Outline Dimensions



IX. Regulatory Compliance

Feature	Reference	Performance
Electrostatic discharge (ESD)	IEC/EN 61000-4-2	Compatible with standards
Electromagnetic Interference (EMI)	FCC Part 15 Class B EN 55022 Class B (CISPR 22A)	Compatible with standards
Laser Eye Safety	FDA 21CFR 1040.10, 1040.11 IEC/EN 60825-1, 2	Class 1 laser product
Component Recognition	IEC/EN 60950, UL	Compatible with standards
ROHS	2002/95/EC	Compatible with standards
EMC	EN61000-3	Compatible with standards

Appendix A. Document Revision

Version No.	Date	Description
1.0	2020-4-1	Preliminary datasheet
2.0	2020-4-17	Update datasheet logo
3.0	2020-4-28	Update LOS De –Assert to -12