

# **FPBP431GL-10XX**

## **1.25G SFP BIDI LC Transceiver Module**

### **Features**

- Operating data rate up to 1.25/1.063Gbps
- Tx1490/Rx1310, 1490nm DFB Laser, 1310nm PIN-TIA
- Distance up to 10KM
- Single 3.3V Power supply and TTL Logic Interface
- Simplex LC Connector Interface
- Hot Pluggable, Metal enclosure, for Lower EMI
- DDM function optional
- Operating Case Temperature:  
Standard: 0°C~+70°C; Industrial: -40°C~+85°C
- Compliant with MSA SFP Specification
- Digital Diagnostic Monitor Function Compatible with SFF-8472
- ROHS6 Compliant

### **Applications**

- Gigabit Ethernet
- WDM Gigabit Ethernet Links
- Xdsl Applications
- Metro Edge Switching

### **Product Description**

The SFP BIDI series single mode transceivers is small form factor pluggable module for bi-directional serial optical data communications such as STM-8, OC-24, Fiber Channel, It is SFP 20-pin connector to allow hot plug capability. This module is designed for single mode fiber and operates at a nominal wavelength of 1490nm.

The transmitter section uses a multiple quantum well laser and is a class 1 laser compliant according to International Safety Standard IEC-60825. The receiver section uses an integrated InGaAs detector preamplifier (IDP) mounted in an optical header and a limiting post-amplifier IC.

The SFP BIDI series are designed to be compliant with SFF-8472 SFP Multi-source Agreement (MSA) and Industry working temperature.

## Laser Eye Safety

Class 1 Laser Product as defined by the Internal Standard IEC 60825-

1: 2014 and by USA regulations for class 1 products per CDRH 21 CFR 1040.1 and 1040.11.

## Absolute Maximum Ratings

Parameter	Symbol	Min.	Typ.	Max.	Unit
Storage Temperature	T <sub>s</sub>	-40		85	°C
Supply Voltage	VCC	-0.5		3.6	V

## Recommended Operating Conditions

Parameter	Symbol	Min.	Typ.	Max.	Unit
Ambient Operating Temperature	Standard	0		70	°C
	Industrial	-40		85	
Supply Voltage	VCC	3.15	3.3	3.45	V
Data Rate	Giga Ethernet		1.25		Gbps
	Fiber Channel		1.063		
Total Supply Current	I <sub>cc</sub>			300	mA
Surge Current	I <sub>surge</sub>			+30	mA

## Performance Specifications - Electronical

Parameter	Symbol	Min.	Typ.	Max.	Unit	Notes
<b>TRANSMITTER</b>						
CML/PECL Inputs (Differential)	V <sub>in</sub>	400		1800	mVpp	AC coupled inputs
Input Impedance (Differential)	Z <sub>in</sub>	90	100	110	ohms	R <sub>in</sub> > 100 kohms @ DC
Tx_DISABLE Input Voltage - High		2		3.45	V	
Tx_DISABLE Input Voltage - Low		0		0.8	V	
Tx_FAULT Output Voltage -- High		V <sub>cc</sub> -0.5		V <sub>cc</sub> +0.3	V	I <sub>o</sub> = 400µA; Host V <sub>cc</sub>
Tx_FAULT Output Voltage -- Low		0		0.5	V	I <sub>o</sub> = -4.0mA
TX_Disable Assert Time	t <sub>off</sub>			10	µs	
TX_Disable Negate Time	t <sub>off</sub>			1	µs	
<b>RECEIVER</b>						
CML Outputs (Differential)	V <sub>out</sub>	370		1800	mVpp	AC coupled outputs
Output Impedance (Differential)	Z <sub>out</sub>	90	100	110	ohms	
Rx_LOS Output Voltage - High		V <sub>cc</sub> -0.5		V <sub>cc</sub> +0.3	V	I <sub>o</sub> = 400µA; Host V <sub>cc</sub>
Rx_LOS Output Voltage - Low		0		0.8	V	I <sub>o</sub> = -4.0mA

## Performance Specifications- Optical

Parameter		Symbol	Min.	Typical	Max.	Unit
9µm Core Diameter SMF	FPBP431GL-10	1490 DFB		10	15	Km
	FPBP431GL-10D	1490 DFB				
	FPBP431GL-10I	1490 DFB				
	FPBP431GL-10DI	1490 DFB				
Data Rate				1.25/1.06		Gbps
Transmitter						
Centre Wavelength		λ <sub>c</sub>	1470	1490	1520	nm
Spectral Width (RMS)		λ			1	nm
Average Output	FPBP431GL-10	P <sub>0</sub> ut	-10		-2	dBm

Power	FPBP431GL-10D		-10		-2	
	FPBP431GL-10I		-10		-2	
	FPBP431GL-10DI		-10		-2	
Extinction Ratio		EX	8.2			dB
Output Optical Eye		ITU-T G.957.Compliant				
Receiver						
Centre Wavelength		$\lambda_c$	1260	1310	1360	nm
Receiver Sensitivity	FPBP431GL-10	PIN			-21	dBm
	FPBP431GL-10D				-21	
	FPBP431GL-10I				-20	
	FPBP431GL-10DI				-20	
Receiver Overload		$P_{max}$ -PIN			-3	dBm
LOS De-Assert		PIN	$LOS_D$		-25	dBm
LOS Assert		PIN	$LOS_A$	-35		dBm

## SFP Transceiver Electrical Pad Layout

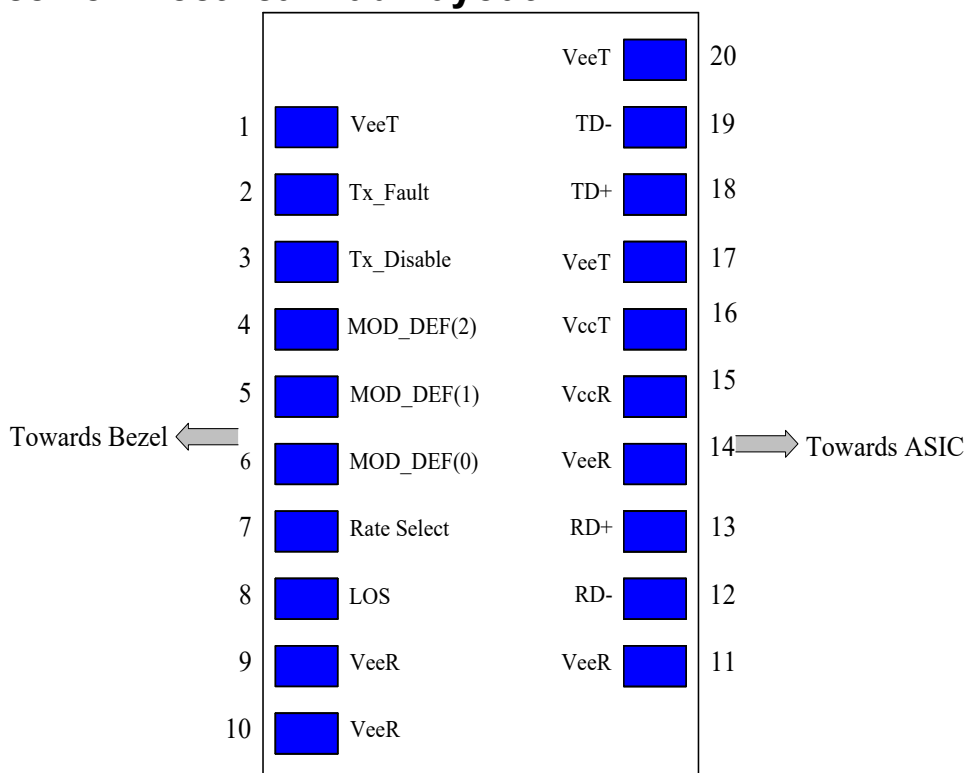


Figure 1 Transceiver pin descriptions

## Pin Function Definitions

Pin Number	Name	FUNCTION	Plug Seq.	Notes
1	VeeT	Transmitter Ground	1	
2	TX Fault	Transmitter Fault Indication	3	Note 1
3	TX Disable	Transmitter Disable	3	Note 2, Module disables on high or open
4	MOD-DEF2	Module Definition 2	3	Note 3, Data line for Serial ID.
5	MOD-DEF1	Module Definition 1	3	Note 3, Clock line for Serial ID.
6	MOD-DEF0	Module Definition 0	3	Note 3, Grounded within the module.
7	Rate Select	Not Connect	3	Function not available
8	LOS	Loss of Signal	3	Note 4
9	VeeR	Receiver Ground	1	Note 5
10	VeeR	Receiver Ground	1	Note 5
11	VeeR	Receiver Ground	1	Note 5
12	RD-	Inv. Received Data Out	3	Note 6
13	RD+	Received Data Out	3	Note 7
14	VeeR	Receiver Ground	1	Note 5
15	VccR	Receiver Power	2	3.3 ± 5%, Note 7
16	VccT	Transmitter Power	2	3.3 ± 5%, Note 7
17	VeeT	Transmitter Ground	1	Note 5
18	TD+	Transmit Data In	3	Note 8
19	TD-	Inv. Transmit Data In	3	Note 8
20	VeeT	Transmitter Ground	1	Note 5

### Notes:

1) TX Fault is an open collector/drain output, which should be pulled up with a 4.7K – 10KΩ resistor on the host board. Pull up voltage between 2.0V and VccT, R+0.3V. When high, output indicates a laser fault of some kind. Low indicates normal operation. In the low state, the output will be pulled to < 0.8V.

2) TX disable is an input that is used to shut down the transmitter optical output. It is pulled up within the module with a 4.7 – 10 K Ω resistor. Its states are:

- Low (0 – 0.8V): Transmitter on
- (>0.8, < 2.0V): Undefined
- High (2.0 – 3.465V): Transmitter Disabled
- Open: Transmitter Disabled

3) Mod-Def 0,1,2. These are the module definition pins. They should be pulled up with a 4.7K – 10KΩ resistor on the host board. The pull-up voltage shall be VccT or VccR (see Section IV for further details). Mod-Def 0 is grounded by the module to indicate that the module is present Mod-Def 1 is the clock line of two wire serial interface for serial ID Mod-Def 2 is the data line of two wire serial interface for serial ID

4) LOS (Loss of Signal) is an open collector/drain output, which should be pulled up with a 4.7K – 10KΩ resistor. Pull up voltage between 2.0V and VccT, R+0.3V. When high, this output indicates the received optical power is below the worst-case receiver sensitivity (as defined by the standard in use). Low indicates normal operation. In the low state, the output will be pulled to < 0.8V.

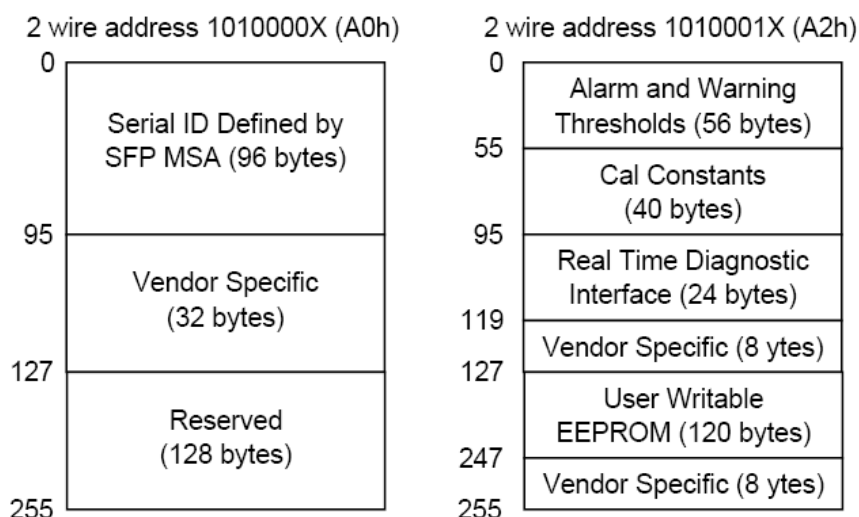
5) VeeR and VeeT may be internally connected within the SFP module.

6) RD-/+: These are the differential receiver outputs. They are AC coupled 100Ω differential lines which should be terminated with 100Ω (differential) at the user SERDES. The AC coupling is done inside the module and is thus not required on the host board. The voltage swing on these lines will be between 370 and 2000 mV differential (185 –1000 mV single ended) when properly terminated.

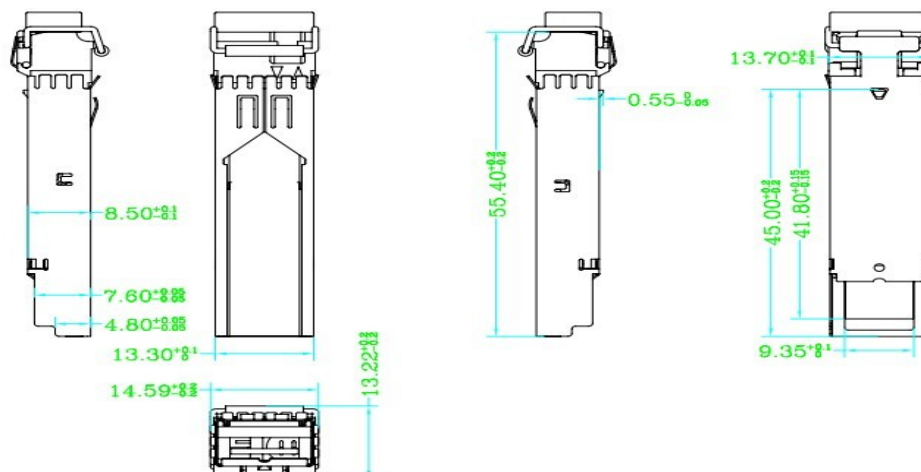
7) VccR and VccT are the receiver and transmitter power supplies. They are defined as 3.3V ±5% at the SFP connector pin. Maximum supply current is 300mA. Recommended host board power supply filtering is shown below. Inductors with DC resistance of less than 1 ohm should be used in order to maintain the required voltage at the SFP input pin with 3.3V supply voltage. When the recommended supply-filtering network is used, hot plugging of the SFP transceiver module will result in an inrush current of no more than 30mA greater than the steady state value. VccR and VccT may be internally connected within the SFP transceiver module.

8) TD-/+: These are the differential transmitter inputs. They are AC-coupled, differential lines with 100Ω differential termination inside the module. The AC coupling is done inside the module and is thus not required on the host board. The inputs will accept differential swings of 500 – 2400 mV (250 – 1200mV single-ended), though it is recommended that values between 500 and 1200 mV differential (250 – 600mV single-ended) be used for best EMI performance.

## Digital Diagnostic Memory Map



**Figure 2 Digital Diagnostic Memory Map**



Product Number	Data Rate	Laser	Receiver	Distance	Interface	DDM	Temp.
FPBP431GL-10	1.25Gbps	1490nm DFB	PIN-TIA	10Km	LC / SC	NO	C
FPBP431GL-10D	1.25Gbps	1490nm DFB	PIN-TIA	10Km	LC / SC	YES	C
FPBP431GL-10I	1.25Gbps	1490nm DFB	PIN-TIA	10Km	LC / SC	NO	I
FPBP431GL-10DI	1.25Gbps	1490nm DFB	PIN-TIA	10Km	LC / SC	YES	I

\*D--- DDM / DOM