

# AXCEN

PHOTONICS CORPORATION

## **AXXE-5886 10Gbps Multi-mode 850nm VCSEL, SFP+ Transceiver**



### **Product Overview**

The AXXE-5886 is specifically designed for the high performance integrated duplex data link over multi-mode optical fiber. This transceiver module is compliant with the Small Form-factor Pluggable Plus (SFP+) Multi-Source Agreement (SFF-8432). An enhanced Digital Diagnostic Monitoring Interface has been incorporated into the Axcen SFP Transceiver. Real time monitors of temperature, supply voltage, laser bias current, laser average output power and received output power are provided, based on the SFF-8472.

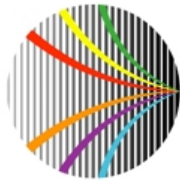
The AXXE-5886 SFP+ transceivers using a short wavelength (850nm) VCSEL enable data transmission up to 300m on a 50/125 $\mu$ m multi-mode optical fiber.

### **Features**

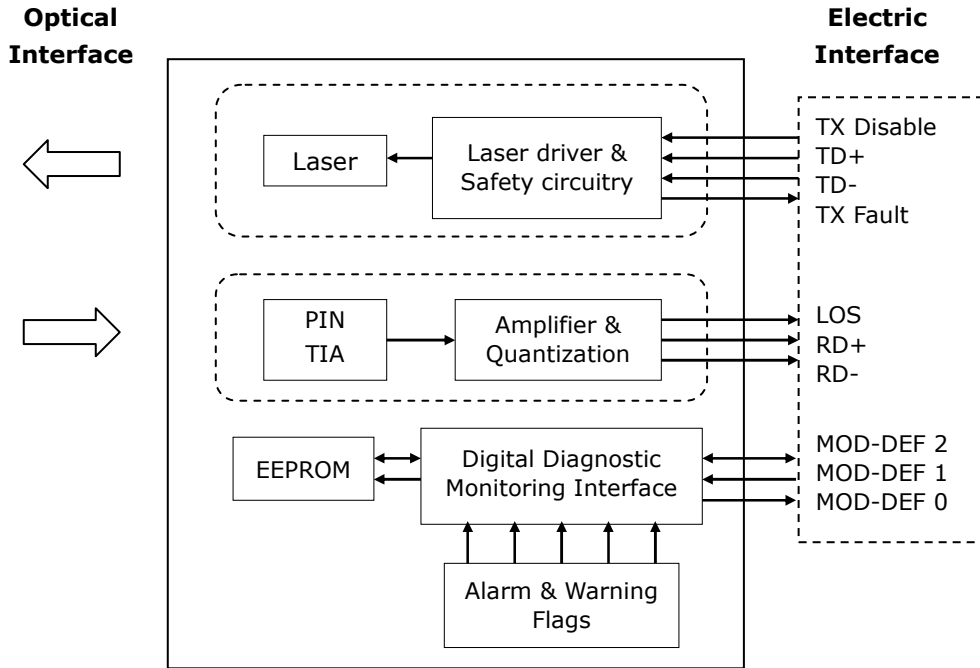
- **SFP+ Multi-Source Agreement compliant**
- **LC duplex receptacle**
- **10Gbps IEEE 802.3ae 10GBASE-SR and 10GBASE-SW compliant**
- **SFF-8472 diagnostic monitoring interface for optical transceivers**
- **Serial ID functionality support**
- **Alarms and warnings to indicate status of real time monitors**

### **Applications**

- **8.5G Fibre Channel**
- **10 Gigabit Ethernet**



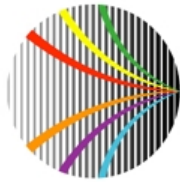
## Block diagram



The transceiver is fundamentally consisted by two parts: transmitter and receiver. The transmitter features a TTL logic level Disable signal and a Fault indicator. The receiver features a TTL logic Loss of Signal (LOS) detection. The serial ID interface defines a 256-byte memory map in EEPROM, 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 and is therefore backward compatible. The detailed signal descriptions are listed in the following sections.

## Absolute Maximum Ratings

Parameter	Symbol	Min.	Max.	Unit	Note
Storage Temperature	$T_s$	-40	+85	°C	
Supply Voltage	$V_{ccT}$ $V_{ccR}$	-0.5	4.5	V	
Storage Relative Humidity	RH	5	95	%	



## Recommended Operating Conditions

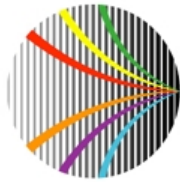
Parameter	Symbol	Min.	Typ.	Max.	Unit	Note
Case Operating Temperature	$T_C$	0		70	$^{\circ}\text{C}$	
Supply Voltage	$V_{CC}$	3.14	3.3	3.47	V	
Supply Current	$I_{TX} + I_{RX}$		180	300	mA	

## Transmitter Electro-Optical Interface

Parameter	Symbol	Min.	Typ.	Max.	Unit	Note
Transmitter Differential Input Voltage	TD +/-	150	900	1600	mVp-p	
Tx_Fault - High	$V_{\text{Fault\_H}}$	2		$V_{CC}$	V	
Tx_Fault - Low	$V_{\text{Fault\_L}}$	$V_{EE}$		$V_{EE}+0.8$	V	
Tx_Disable - High	$V_{\text{Disable\_H}}$	2		$V_{CC}$	V	
Tx_Disable - Low	$V_{\text{Disable\_L}}$	$V_{EE}$		$V_{EE}+0.8$	V	
Average Launch Power	$P_O$	-7.3		-1	dBm	1
Launch Power in OMA	$P_{O\_OMA}$				dBm	1,2
Optical Extinction Ratio	$E_R$	3			dB	
Center Wavelength	$\lambda_C$	840	850	860	nm	
Spectral Width (RMS)	$\Delta\lambda$			0.45	nm	2
Relative Intensity Noise	$RIN_{12\text{OMA}}$			-128	dB/Hz	

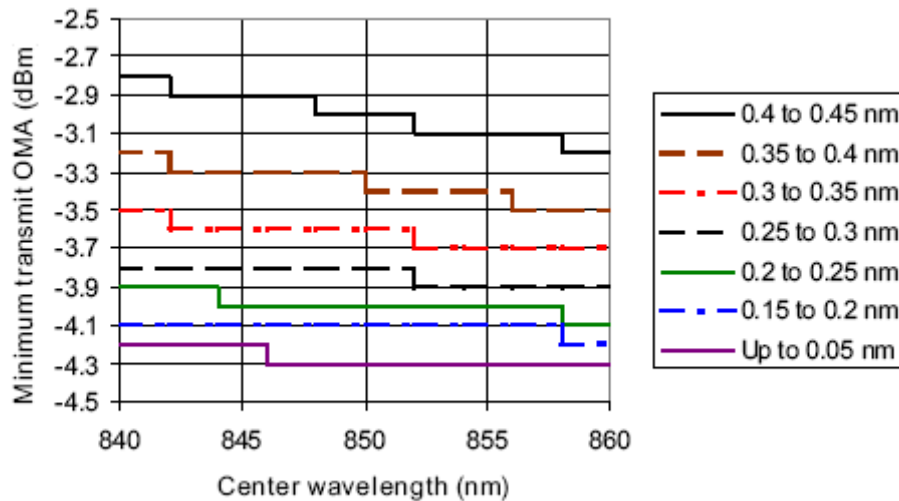
### Notes:

1. Coupling into a 50/125 $\mu\text{m}$  multi-mode fiber.
2. Trade-offs are available between spectral width, center wavelength and minimum optical modulation amplitude. See Table 1, Figure 1

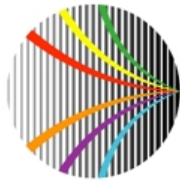


**Table 1 – Minimum 10GBASE-S optical modulation amplitude (dBm) as a function of center wavelength and spectral width**

Center Wavelength (nm)	RMS Spectral width (nm)								
	Up to 0.05	0.05 to 0.1	0.1 to 0.15	0.15 to 0.2	0.2 to 0.25	0.25 to 0.3	0.3 to 0.35	0.35 to 0.4	0.4 to 0.45
840 to 842	-4.2	-4.2	-4.1	-4.1	-3.9	-3.8	-3.5	-3.2	-2.8
842 to 844	-4.2	-4.2	-4.2	-4.1	-3.9	-3.8	-3.6	-3.3	-2.9
844 to 846	-4.2	-4.2	-4.2	-4.1	-4.0	-3.8	-3.6	-3.3	-2.9
846 to 848	-4.3	-4.2	-4.2	-4.1	-4.0	-3.8	-3.6	-3.3	-2.9
848 to 850	-4.3	-4.2	-4.2	-4.1	-4.0	-3.8	-3.6	-3.3	-3.0
850 to 852	-4.3	-4.2	-4.2	-4.1	-4.0	-3.8	-3.6	-3.4	-3.0
852 to 854	-4.3	-4.2	-4.2	-4.1	-4.0	-3.9	-3.7	-3.4	-3.1
854 to 856	-4.3	-4.3	-4.2	-4.1	-4.0	-3.9	-3.7	-3.4	-3.1
856 to 858	-4.3	-4.3	-4.2	-4.1	-4.0	-3.9	-3.7	-3.5	-3.1
858 to 860	-4.3	-4.3	-4.2	-4.2	-4.1	-3.9	-3.7	-3.5	-3.2



**Figure 1 –Triple tradeoff curve for 10GBASE-S (informative)**



## Receiver Electro-Optical Interface

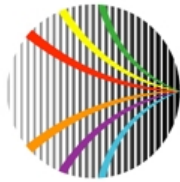
Parameter	Symbol	Min.	Typ.	Max.	Unit	Note
Receiver Differential Output Voltage	RD +/-	300		1000	mVp-p	
Average Receiver Power	P <sub>IN</sub>	-9.9		-1	dBm	1
Receiver Sensitivity in OMA	P <sub>IN,OMA</sub>			-11.1	dBm	1
Operating Center Wavelength	λ <sub>c</sub>	840		860	nm	
Receiver Reflectance	RL			-12	dB	
Receiver Loss of Signal - TTL Low	P <sub>RX_LOSD</sub>			-11	dBm	
Receiver Loss of Signal - TTL High	P <sub>RX_LOSA</sub>	-30			dBm	

### Notes:

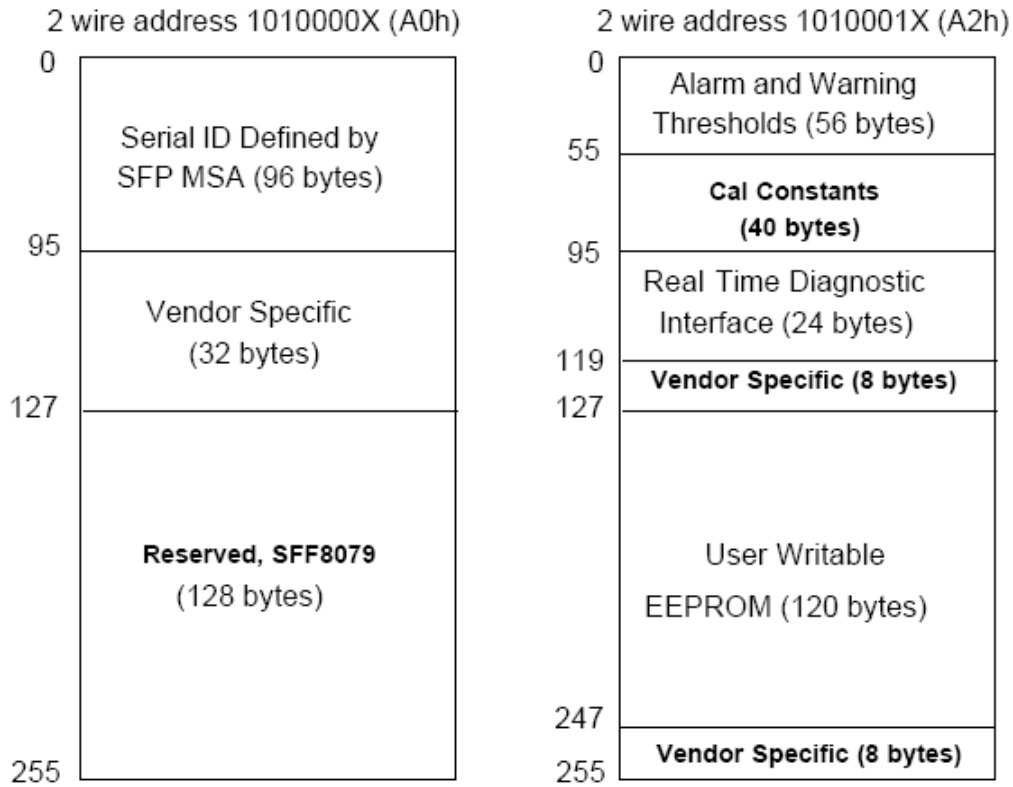
1. With BER better than or equal to  $1 \times 10^{-12}$ , measured in the center of the eye opening with PRBS 2<sup>31</sup> -1

## Operating Range for Each Optical Fiber Type

Fiber type		Minimum modal bandwidth @850nm (MHz*km)	Operating range (meters)
62.5μm MMF		160	2 to 26
	OM1	200	2 to 33
50μm MMF		400	2 to 66
	OM2	500	2 to 82
	OM3	2000	2 to 300

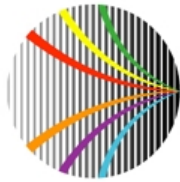


## Digital Diagnostic Memory Map

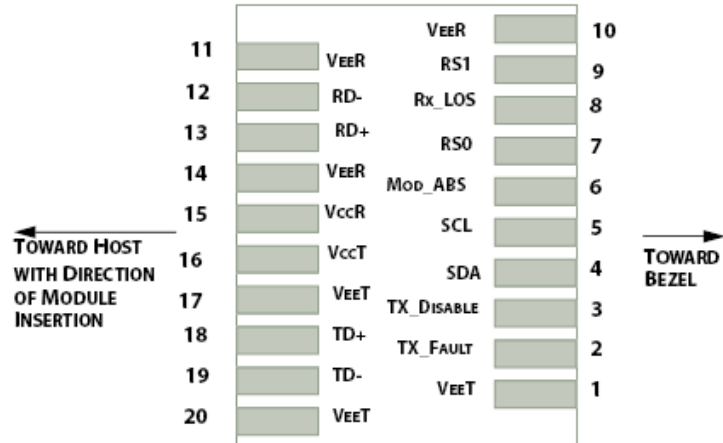


## Digital Diagnostic Monitoring Characteristics

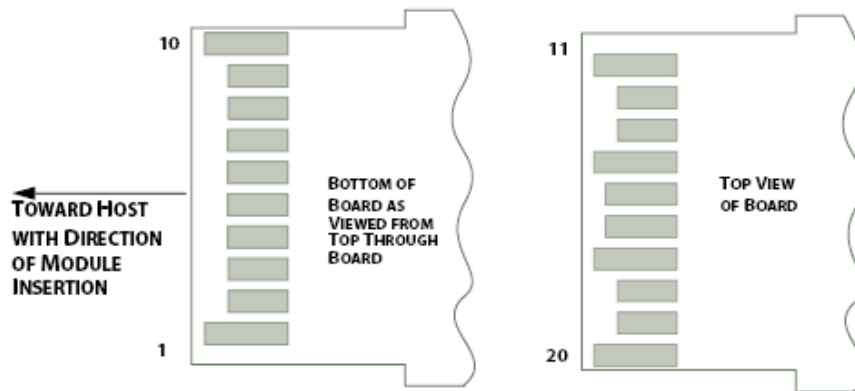
Parameter	Symbol	Accuracy	Unit	Note
Transceiver Temperature	$T_{INT}$	$\pm 3$	$^{\circ}C$	
Transceiver Supply Voltage	$V_{INT}$	$\pm 3$	%	
TX Bias Current	$I_{BIAS}$	$\pm 10$	%	
TX Output Power	$P_{TX}$	$\pm 3$	dB	
RX Received Optical Power	$P_{RX}$	$\pm 3$	dB	



## Pin Description



## Host PCB SFP+ pad assignment top view



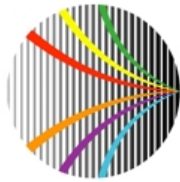
## SFP+ module contact assignment



## SFP+ Module and Host Electrical contact definition

Contacts	Logic	Symbol	Power Sequence Order	Name / Description
1		VeeT	1st	Module Transmitter Ground
2	LVTTTL-O	TX_Fault	3rd	Module Transmitter Fault
3	LVTTTL-I	TX_Disable	3rd	Transmitter Disable; Turns off transmitter laser output
4	LVTTTL-I/O	SDA	3rd	2-wire Serial Interface Data Line (Same as MOD-DEF2 in the INF-8074i)
5	LVTTTL-I/O	SCL	3rd	2-wire Serial Interface Clock (Same as MOD-DEF1 in the INF-8074i)
6		Mod_ABS	3rd	Module Absent, connected to VeeT or VeeR in the module
7	LVTTTL-I	RS0	3rd	Rate Select 0, optionally controls SFP+ module receiver. When high input signaling rate > 4.25 GBd and when low input signaling rate $\leq$ 4.25 GBd.
8	LVTTTL-O	Rx_LOS	3rd	Receiver Loss of Signal Indication (In FC designated as Rx_LOS and in Ethernet designated as Signal Detect Bar)
9	LVTTTL-I	RS1	3rd	Rate Select 1, optionally controls SFP+ transmitter. When high input signaling rate > 4.25 GBd and when low input signaling rate $\leq$ 4.25 GBd.
10		VeeR	1st	Module Receiver Ground
11		VeeR	1st	Module Receiver Ground
12	CML-O	RD-	3rd	Receiver Inverted Data Output
13	CML-O	RD+	3rd	Receiver Non-Inverted Data Output
14		VeeR	1st	Module Receiver Ground
15		VccR	2nd	Module Receiver 3.3V Supply
16		VccT	2nd	Module Transmitter 3.3V Supply
17		VeeT	1st	Module Transmitter Ground
18	CML-I	TD+	3rd	Transmitter Non-Inverted Data Input
19	CML-I	TD-	3rd	Transmitter Inverted Data Input
20		VeeT	1st	Module Transmitter Ground

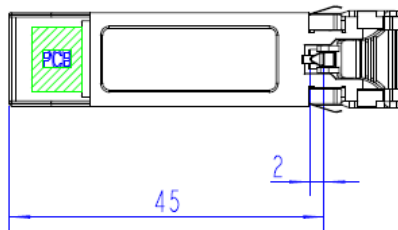
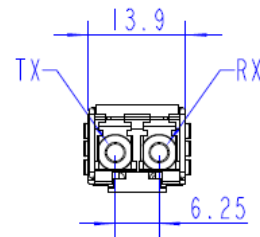
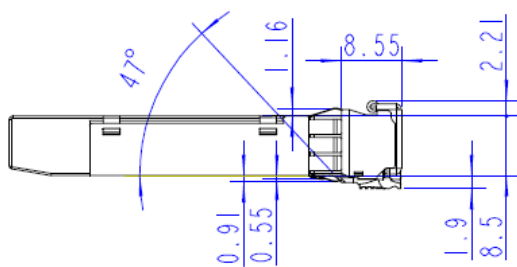
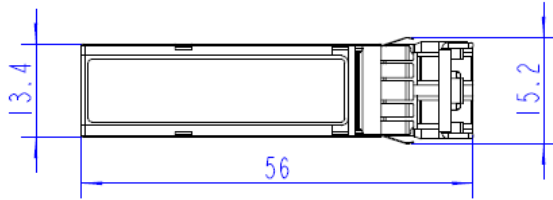




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## Mechanical Dimensions (Units in mm)



Unit : mm  
 All dimensions are  $\pm 0.2$  mm unless otherwise specified.

## Ordering Information

### AXXE-5886-05B1

Model No.	Wavelength	LD	I/O	SD	Link	Temp.
AXXE-5886-05B1	850nm	VCSEL	AC/AC	TTL	300m	0~70°C