



10G SFP+ Active Optical Cable (AOC) Hot Pluggable, 850nm VCSEL, MMF 1~150M, DDM

Part Number: FAOC-10G-SPSP-xxx-xx



Overview

FAOC-10G-SPSP-xxx-xx 10G SFP+ Active Optical Cables (AOC) are direct-attach fiber assemblies with SFP+ form factor. The AOC utilize multi-mode fiber with 850nm VCSEL and PIN PD. It could be used as an alternative solution to SFP+ passive and active copper cables, while providing improved signal integrity, longer distances, superior electro-magnetic immunity & better bit error rate performance. They are suitable for 1~150 meters distances and offer a cost-effective way for very high port density connections.

Applications

- 10GBASE-SR Ethernet Link
- InfiniBand SDR, DDR, QDR, FDR-10
- Data Center & Storage
- Datacom / Telecom Switch & Router

Features

- Compatible with IEEE802.3ae 10GBASE-SR
- Compliant with SFF-8431 SFP+ MSA
- Support InfiniBand SDR, DDR, QDR & FDR-10
- Up to 11.2Gbps data rate
- Hot Pluggable
- 850nm VCSEL transmitter and PIN receiver
- 2-wire interface for management and diagnostic monitor compliant with SFF-8472
- Single 3.3V power supply
- Link distance up to 150m over MM OM3 fiber
- Low power consumption <1.0W
- RoHS Compliant



Absolute Maximum Ratings

Parameters	Symbol	Min.	Max.	Unit
Storage Temperature	T _{ST}	-20	+85	°C
Storage Relative Humidity	RH	5	85	%
Supply Voltage	V _{CC}	-0.5	+3.6	V

Recommended Operating Conditions

Parameters	Symbol	Min.	Typ.	Max.	Unit
Case Operating Temperature	T _{OP}	0	-	+70	°C
Supply Voltage	V _{CC}	+3.13	+3.3	+3.47	V
Supply Current, per SFP+	I _{CC}			300	mA
Power Consumption, per SFP+	P			1.0	W
Operating Data Rate	DR	1.0625	10.3125		Gb/s
Bit Error Rate	BER			10 ⁻¹²	
Minimum Cable Bending Radius		30			mm
Case Operating Temperature	T _{OP}	0	-	+70	°C

Transmitter Electro-optical Characteristics

V_{CC}= 3.13V to 3.47V, T_{OP} = 0 °C to 70 °C

Parameters	Symbol	Min.	Typ.	Max.	Unit	Note
Optical Launch Power	P _O	-6.0		+2.4	dBm	
Optical Center Wavelength	λ _c	820	850	880	nm	
Spectral Width (RMS)	Δλ			0.45	nm	
Optical Extinction Ratio	ER	3			dB	
Differential Input Impedance	Z _{IN}	90	100	110	Ω	
Differential Data Input Swing	V _{IN}	200		1000	mV	
Tx Disable Input Voltage-Low (Tx ON)	TDISV _L	V _{EE} -0.3		0.8	V	
Tx Disable Input Voltage-High (Tx OFF)	TDISV _H	2.0		V _{CC} +0.3	V	
Tx Fault Output Voltage-Low (Tx Normal)	TFLT _V _L	V _{EE} -0.3		0.4	V	
Tx Fault Output Voltage-High (Tx Fault)	TFLT _V _H	2.0		V _{CC} +0.3	V	

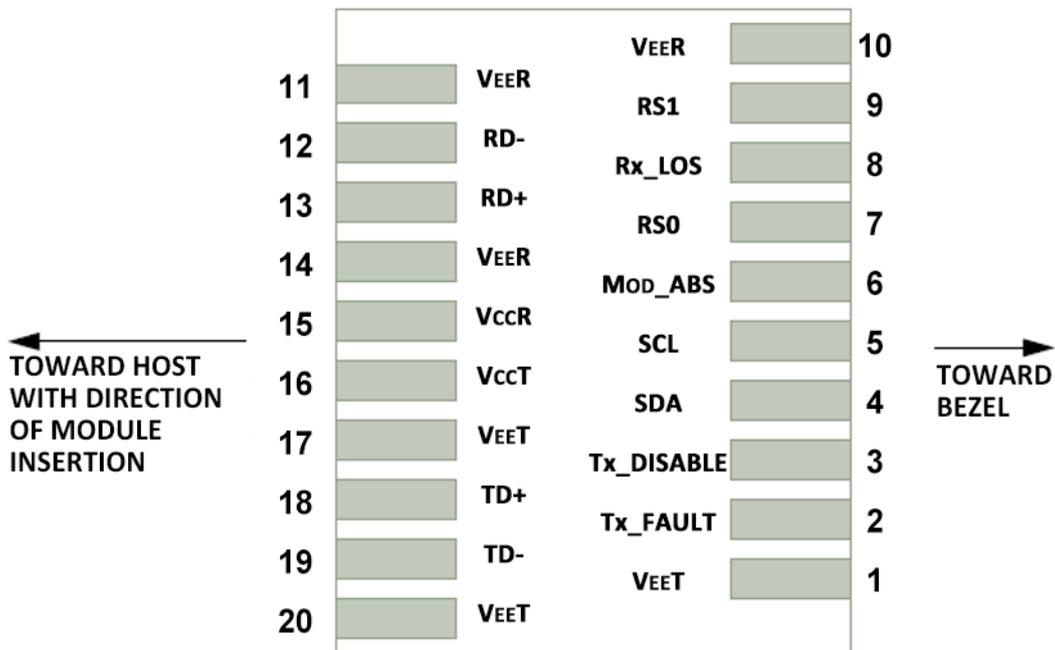


Receiver Electro-optical Characteristics

$V_{CC} = 3.13V$ to $3.47V$, $T_{OP} = 0\text{ }^{\circ}C$ to $70\text{ }^{\circ}C$

Parameters	Symbol	Min.	Typ.	Max.	Unit	Note
Optical Center Wavelength	λ_c	820	850	880	nm	
Differential Output Impedance	Z_{OUT}	90	100	110	Ω	
Differential Data Output Swing	V_{OUT}	200		1000	mV	
Receiver LOS Signal Output Voltage-Low	LOS _{VL}	$V_{EE}-0.3$		0.4	V	
Receiver LOS Signal Output Voltage-High	LOS _{VH}	2.0		$V_{CC}+0.3$	V	

Pin Assignment



Host PCB SFP+ Pad Assignment Top View



Pin Description

Pin	Name	Function / Description
1	VEET	Transmitter Ground
2	Tx_FAULT	Transmitter Fault Indication (1)
3	Tx_DISABLE	Transmitter Disable – Turns off transmitter laser output (2)
4	SDA	2-wire Serial Interface Data Line (SDA: Serial Data Signal) (3)
5	SCL	2-wire Serial Interface Clock (SCL: Serial Clock Signal) (3)
6	MOD_ABS	Module Absent, connected to VEET or VEER in the module (3)
7	RS0	Rate Select 0, optional (5)
8	Rx_LOS	Receiver Loss of Signal Indication (4)
9	RS1	Rate Select 1, optional (5)
10	VEER	Receiver Ground
11	VEER	Receiver Ground
12	RD-	Receiver Inverted Data output, AC coupled
13	RD+	Receiver Non-Inverted Data output, AC coupled
14	VEER	Receiver Ground
15	VccR	Receiver 3.3V Power Supply
16	Vcct	Transmitter 3.3V Power Supply
17	VEET	Transmitter Ground
18	TD+	Transmitter Non-Inverted Data Input, AC coupled
19	TD-	Transmitter Inverted Data Input, AC coupled
20	VEET	Transmitter Ground

Note1: Tx Fault is open collector/drain output which should be pulled up externally with a 4.7K~10KΩ resistor on the host board to supply $<V_{ccT}+0.3V$ or $V_{ccR}+0.3V$. When high, this output indicates a laser fault of some kind. Low indicates normal operation. In the low state, the output will be pulled to $<0.8V$.

Note2: Tx Disable input is used to shut down the laser output per the state table below. It is pulled up within the module with a 4.7K~10KΩ resistor. 1) Low(0~0.8V): Transmitter on; 2) Between(0.8V and 2V): Undefined; 3) High (2.0~ V_{ccT}): Transmitter Disabled; 4) Open: Transmitter Disabled.

Note3: These are the module definition pins. They should be pulled up with a 4.7K~10KΩ resistor on the host board to supply less than $V_{ccT}+0.3V$ or $V_{ccR}+0.3V$. MOD_ABS is grounded by the module to indicate that the module is present.

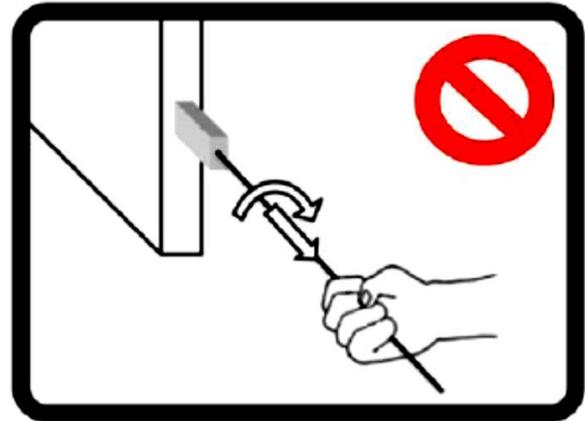
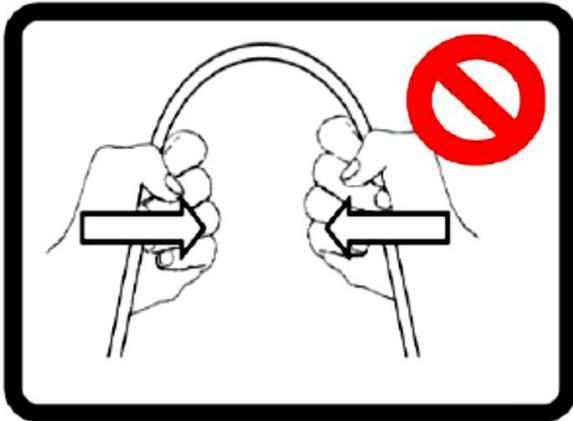
Note4: Rx_LOS (Loss of signal) is an open collector/drain output which should be pulled up externally with a 4.7K~10KΩ resistor on the host board to supply $<V_{ccT}+0.3V$ or $V_{ccR}+0.3V$. When high, this output indicates the received optical power is below the worst case receiver sensitivity (as defined by the standard in use). Low indicates normal operation. In the low state, the output will be pulled to $<0.8V$.

Note5: Tied to ground through a 30K ohm resistor.



Handling

Care should be taken to restrict exposure to the conditions defined in the Absolute Maximum Ratings and Recommended Operating Conditions. Put the product in an even and stable location. If the product falls down or drops, it may cause an injury or malfunction. The cable must not be subject to extreme bends during installation or while in operation. If you bend the cable at a radius less than the cable minimum bend radius, then the cable may get damaged. Don't twist or pull by force ends of the cable, which might cause malfunction. In addition, the bending direction should be perpendicular to the flat surface of the ribbon cable. Please do not bend or kink the cable in lateral directions of flat surface of the ribbon.



Digital Diagnostic Functions

As defined by the SFP MSA (SFF-8472) Ficer's SFP+ transceivers provide digital diagnostic functions via a 2-wire serial interface, which allows real-time access to the following operating parameters:

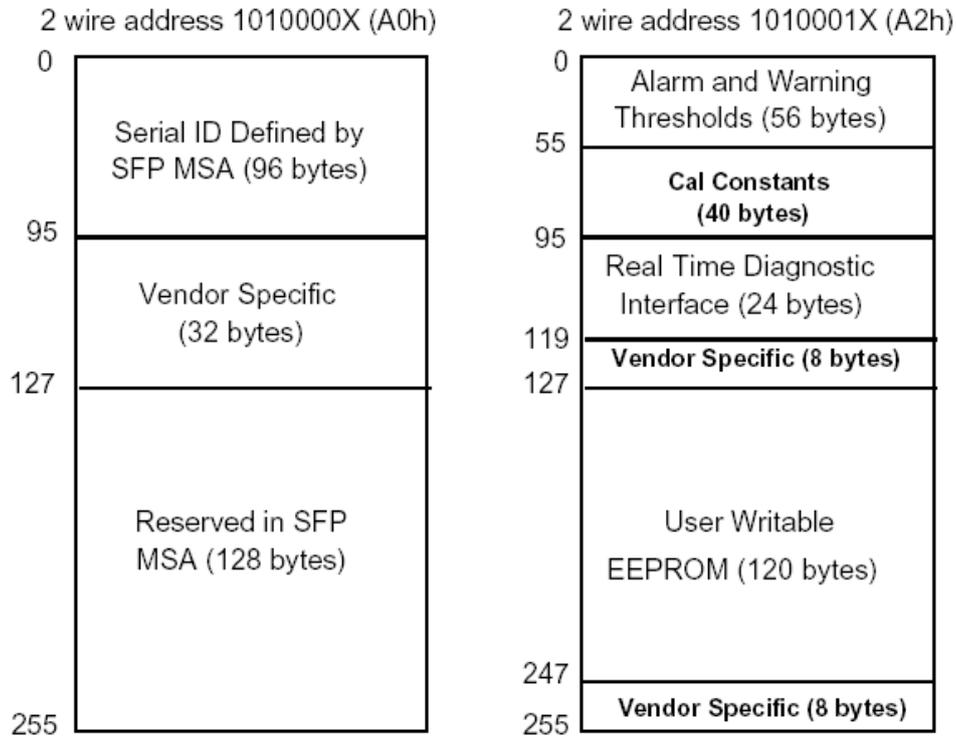
- Transceiver temperature
- Laser bias current
- Transmitted optical power
- Received optical power
- Transceiver supply voltage

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 Controller (DDC) 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 SFP+ transceiver into those segments of its memory map that are not write-protected. The negative edge clocks data from the SFP+ 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. For more detailed information including memory map definitions, please see the SFP MSA (SFF-8472) Specification.



Digital Diagnostic Memory Map

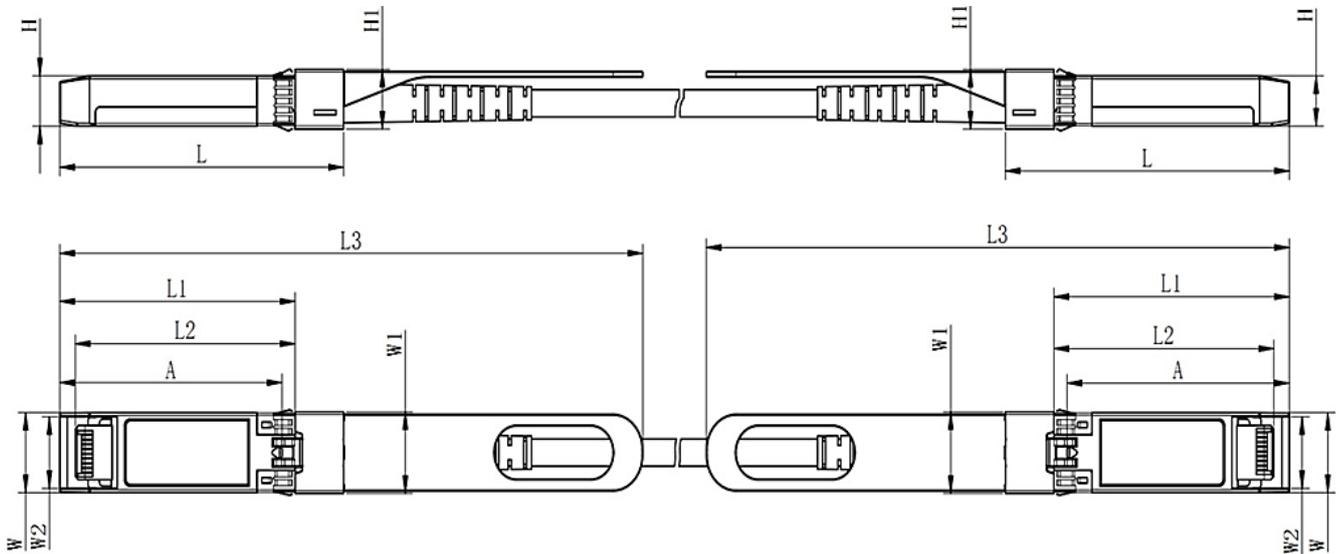


Digital Diagnostic Monitoring Characteristics

Parameter	Accuracy	Unit	Note
Temperature	±3	°C	Internal Calibration
Supply Voltage	±0.1	V	Internal Calibration
Tx Bias Current	±5	mA	Internal Calibration
Tx Output Power	±3	dB	Internal Calibration
Rx Received Optical Power	±3	dB	Internal Calibration



Mechanical Dimensions



	L	L1	L2	L3	W	W1	W2	H	H1	A
Max	57.6	47.7	44.55	119.9	13.8	14.0	12.3	8.7	10.3	45.25
Typical	57.4	47.5	44.35	117.9	13.55	13.8	12.1	8.5	10.1	45
Min	57.2	47.3	44.15	115.9	13.3	13.6	11.9	8.4	9.9	44.65

(All Dimensions are $\pm 0.20\text{mm}$ Unless Otherwise Specified, Unit: mm)

Cable Length (CL)	Tolerance
< 1m	+5 / -0cm
1 ~ 4.5m	+15 / -0cm
5m ~ 14.5m	+30 / -0cm
15m ~ 100m	+2% / -0cm



Ordering Information

FAOC-10G-SPSP--L3

Cable Length

meters (including SFP+)

Example: 003=3m, 015=15m, 100=100m, 0X5=0.5m, 3X5=3.5m

Cable Jacket

P: PVC Q: OFNP
L: LSZH* (default)

Fiber Type

2: MM 50/125 OM2
3: MM 50/125 OM3* (default)
4: MM 50/125 OM4