



## **25G SFP28 Active Optical Cable (AOC)** **Hot Pluggable, 850nm VCSEL, MMF 1~100M, DDM**

**Part Number: FAOC-25G-SPSP-xxx-xx**



### **Overview**

FAOC-25G-SPSP-xxx-xx 25G SFP+ Active Optical Cables (AOC) are direct-attach fiber assemblies with SFP28 form factor. The AOC utilize multi-mode fiber with 850nm VCSEL and PIN PD. It could be used as an alternative solution to SFP28 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 1~100 meters distances and offer a cost-effective way for very high port density connections.

### **Applications**

- 25GBASE-SR Ethernet Link
- InfiniBand EDR, FDR-10
- Data Center & Storage
- Datacom / Telecom Switch & Router

### **Features**

- Compatible with IEEE802.3by 25GBASE-SR
- Compliant with SFF-8402 SFP28 MSA
- Support InfiniBand EDR, FDR-10
- Up to 25.78125Gbps 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 100m over MM OM4 fiber and 70m over MM OM3 fiber
- Low power consumption <1.0W
- RoHS Compliant



## Absolute Maximum Ratings

Parameters	Symbol	Min.	Max.	Unit
Storage Temperature	T <sub>ST</sub>	-20	+85	°C
Storage Relative Humidity	RH	5	85	%
Supply Voltage	V <sub>CC</sub>	-0.5	+3.6	V

## Recommended Operating Conditions

Parameters	Symbol	Min.	Typ.	Max.	Unit
Case Operating Temperature	T <sub>OP</sub>	0	-	+70	°C
Supply Voltage	V <sub>CC</sub>	+3.13	+3.3	+3.47	V
Supply Current, per SFP28	I <sub>CC</sub>			300	mA
Power Consumption, per SFP28	P			1.0	W
Operating Data Rate	DR	10.3125	25.78125		Gb/s
Bit Error Rate ( Pre-FEC )	BER			5x10 <sup>-5</sup>	
Bit Error Rate ( Post-FEC )	BER			10 <sup>-12</sup>	
Minimum Cable Bending Radius		30			mm

## Transmitter Electro-optical Characteristics

V<sub>CC</sub>= 3.13V to 3.47V, T<sub>OP</sub> = 0 °C to 70 °C

Parameters	Symbol	Min.	Typ.	Max.	Unit	Note
Optical Launch Power	P <sub>O</sub>	-6.0		+2.4	dBm	
Optical Center Wavelength	λ <sub>c</sub>	820	850	880	nm	
Spectral Width (RMS)	Δλ			0.6	nm	
Optical Extinction Ratio	ER	2			dB	
Differential Input Impedance	Z <sub>IN</sub>	90	100	110	Ω	
Differential Data Input Swing	V <sub>IN</sub>	200		1000	mV	
Tx Disable Input Voltage-Low (Tx ON)	TDISV <sub>L</sub>	V <sub>EE</sub> -0.3		0.8	V	
Tx Disable Input Voltage-High (Tx OFF)	TDISV <sub>H</sub>	2.0		V <sub>CC</sub> +0.3	V	
Tx Fault Output Voltage-Low (Tx Normal)	TFLT <sub>V<sub>L</sub></sub>	V <sub>EE</sub> -0.3		0.4	V	
Tx Fault Output Voltage-High (Tx Fault)	TFLT <sub>V<sub>H</sub></sub>	2.0		V <sub>CC</sub> +0.3	V	

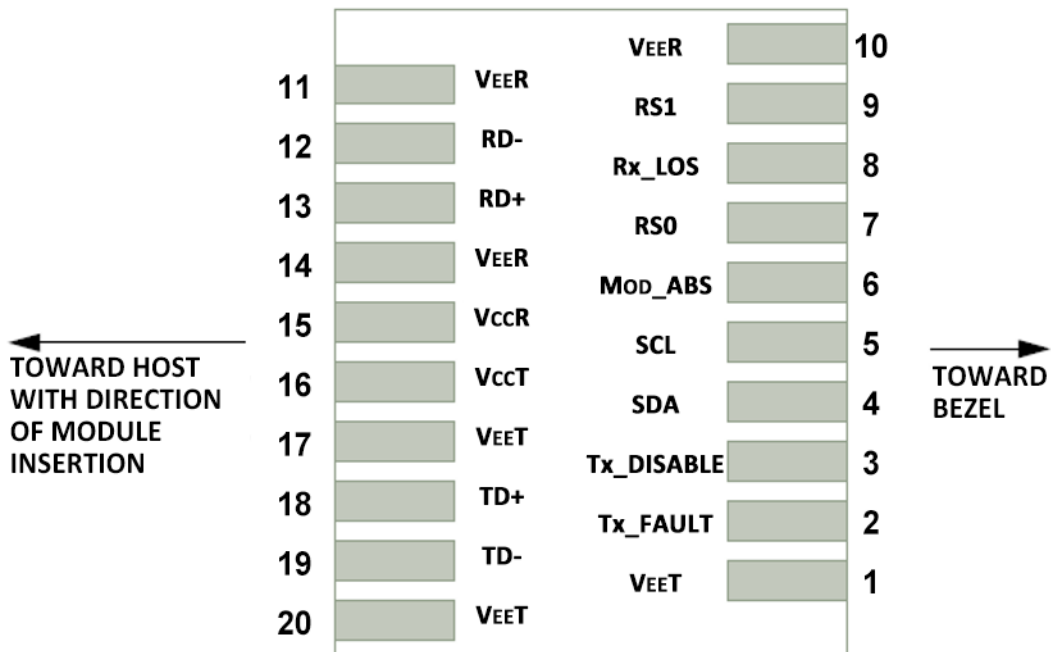


## Receiver Electro-optical Characteristics

V<sub>CC</sub> = 3.13V to 3.47V, T<sub>OP</sub> = 0 °C to 70 °C

Parameters	Symbol	Min.	Typ.	Max.	Unit	Note
Optical Center Wavelength	$\lambda_c$	820	850	880	nm	
Differential Output Impedance	Z <sub>OUT</sub>	90	100	110	$\Omega$	
Differential Data Output Swing	V <sub>OUT</sub>	200		1000	mV	
Receiver LOS Signal Output Voltage-Low	LOS <sub>VL</sub>	V <sub>EE</sub> -0.3		0.4	V	
Receiver LOS Signal Output Voltage-High	LOS <sub>VH</sub>	2.0		V <sub>CC</sub> +0.3	V	

## Pin Assignment



Host PCB SFP28 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.

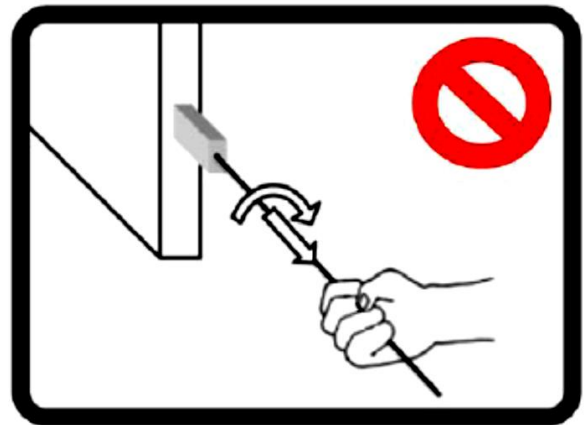
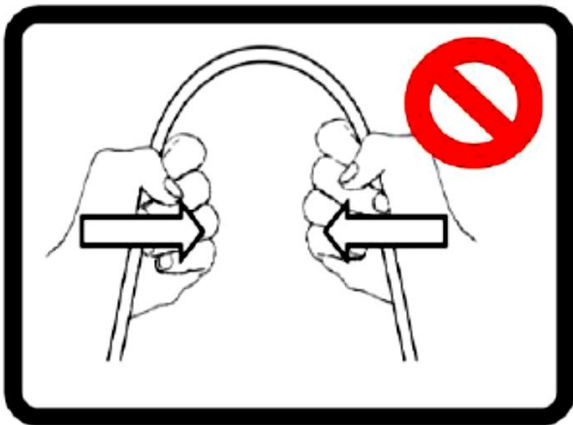
**Note4:** Rx\_LOS (Loss of signal) is an open collector/drain output which should be pulled up externally with a 4.7K~10KΩ resistor on the host board to supply  $<V_{ccT}+0.3V$  or  $V_{ccR}+0.3V$ . When high, this output indicates the received optical power is below the worst case receiver sensitivity (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 SFP28 transceivers provide digital diagnostic functions via a 2-wire serial interface, which allows real-time access to the following operating parameters:

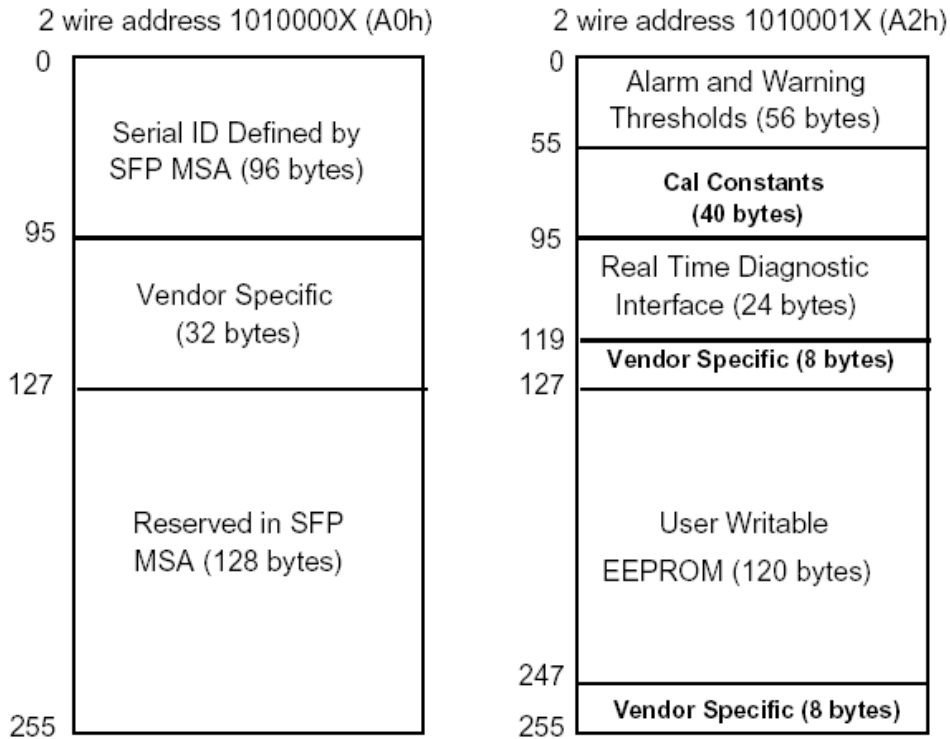
- Transceiver temperature
- Laser bias current
- Transmitted optical power
- Received optical power
- Transceiver supply voltage

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 SFP28 transceiver into those segments of its memory map that are not write-protected. The negative edge clocks data from the SFP28 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

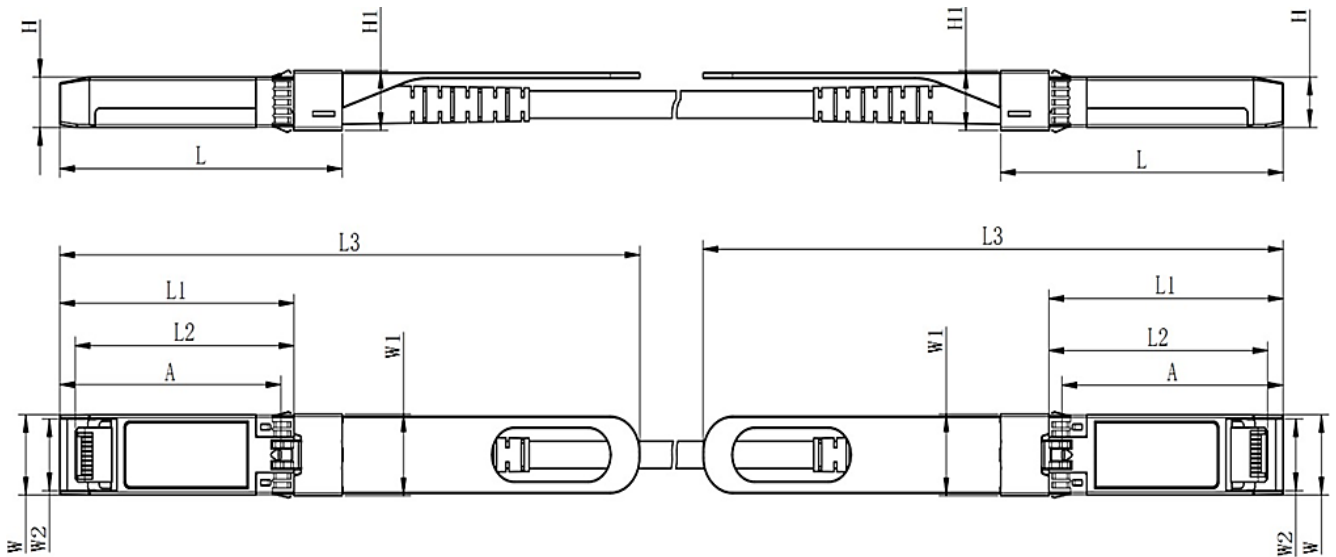


## Digital Diagnostic Monitoring Characteristics

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
<b>Max</b>	57.6	47.7	44.55	119.9	13.8	14.0	12.3	8.7	10.3	45.25
<b>Typical</b>	57.4	47.5	44.35	117.9	13.55	13.8	12.1	8.5	10.1	45
<b>Min</b>	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-25G-SPSP--L3

**Cable Length**

meters ( including SFP28 )

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