

SFP28 25G Active Optical Cable for liquid cooling

AOC-S4S4-xxx-C

Features

- Electrical interface compliant to SFF-8431
- 850nm VCSEL laser and PIN photo-detector
- Maximum link length of 100m on OM4 MMF
- Digital diagnostics functions are available via the I2C interface
- Operating case temperature
Commercial: 0°C to +70°C
- +3.3V single power supply
- Power consumption less than 1W
- RoHS compliant
- Password protection for A0h and A2h



Applications

- 25GBASE-SR Ethernet
- Especially design for liquid immersion environment

Description

The 10Gtek 25G SFP28 active optical cable (AOC-S4S4-xxx-C) is designed for use in 25 Gigabit Ethernet links up to 100m over Multi-Mode Fiber (MMF) especially for liquid immersion environment. It is a single-Channel, Pluggable, Fiber-Optic SFP28 for Infiniband EDR Applications. This module incorporates 10Gtek proven circuit and VCSEL technology to provide reliable long life, high performance, and consistent service. They are suitable for very short distances and offer a cost-effective way to connect within racks and across adjacent racks.

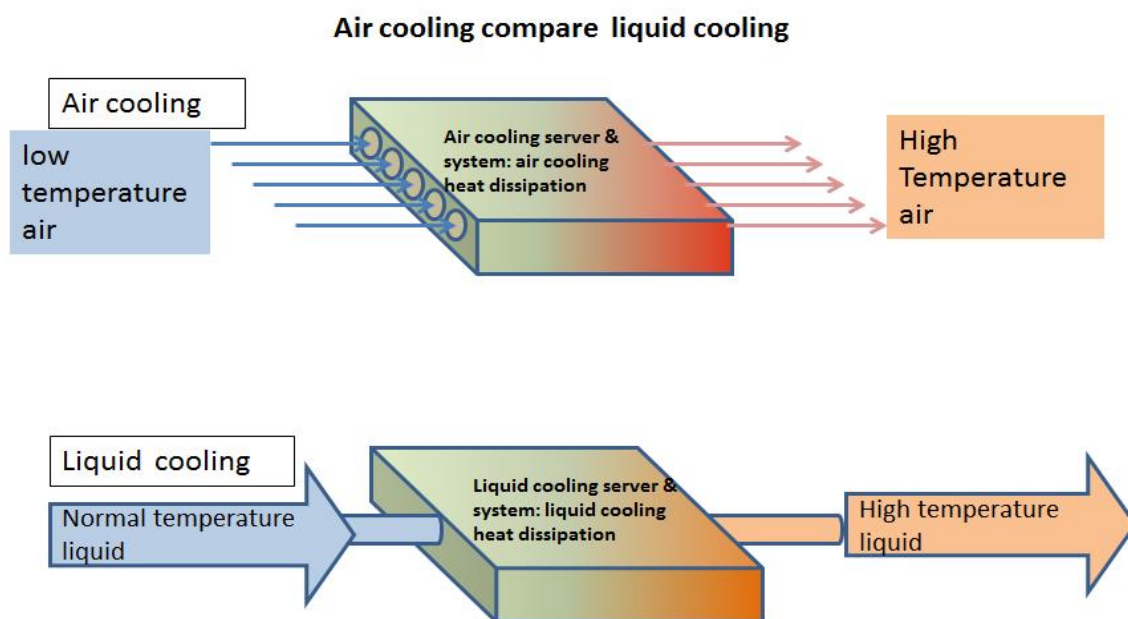


Figure 1. Liquid cooling advantage

As the requirement of data traffic keeping growth and the heat flux emitted by data center internal chips increases constantly, traditional air cooling methods are under pressure. Liquid cooling technologies removes the heat more efficiently with dielectric fluids that have high heat capacity to improve the efficiency of energy in data center.

10Gtek solved the lack of optical transceivers which perform reliability in immersion even liquid immersion depth up to 10m, the Liquid cooling optical series transceiver is suitable for liquid cooling server & server, this series product compatible with mineral oils well.

Absolute Maximum Ratings

Table1- Absolute Maximum Ratings

Form Parameter	Symbol	Min	Typ	Max	Unit	Ref.
Supply Voltage	Vcc3	-0.5		+3.6	V	
Storage Temperature	Ts	-10		+70	°C	
Operating Humidity	RH	5		85	%	1

Note: 1 No condensation

Recommended Operating Conditions

Table 2- Recommended operating Conditions

Parameter	Symbol	Min.	Typical	Max.	Unit	Notes
Operating Case Temperature	Tc	0	-	+70	°C	
Power Supply Voltage	Vcc	3.14	3.3	3.47	V	
Power Supply Current	Icc	-	-	300	mA	
Power Dissipation	Pd	-	-	1.0	W	
Bit Rate	BR	8.5	25.78125	-	Gbps	
Fiber Bend Radius	Rb	3	-	-	cm	

Electrical Characteristics

Table 3- Electrical Characteristics

Parameter		Symbol	Min	Typ	Max	Units	Notes
Electrical Transmitter Characteristics							
Differential Data Input Swing		V _{in,p-p}	200	-	1600	mV _{pp}	
Input Differential Impedance		Z _{IN}	90	100	110	Ω	
Tx_Fault	Normal Operation	VOL	0	-	0.8	V	
	Transmitter Fault	VOH	2.0	-	Vcc	V	
Tx_Disable	Normal Operation	VIL	0	-	0.8	V	
	Laser Disable	VIH	2.0	-	Vcc+0.3	V	
Electrical Receiver Characteristics							
Differential Date Output Swing		V _{out}	400	-	800	mV	
Output Differential Impedance		Z _D	90	100	110	Ω	
Rx_LOS	Normal Operation	VOL	0	-	0.8	V	
	Transmitter Fault	VOH	2.0	-	Vcc	V	

Optical Characteristics

Table 4-Optical Characteristics

Parameter	Symbol	Unit	Min	Typical	Max	Notes
Optical transmitter Characteristics						
Bit Rate	BR	Gbps	8.5	25.78125		
Centre Wavelength Range	λ _c	nm	820	850	880	
Average Output Power Tx_off	P _{off}	dBm	-	-	-45	
Launch Optical Power	P _o	dBm	-6.0		2.4	1
Extinction Ratio	ER	dB	2	-	-	

Spectral Width(RMs)	RMs	nm	-	-	0.65	
Differential data input swing	VIN,PP	mV	40		1000	
Spectral Width(RMS)	RMS	nm	-	-	0.65	
Optical Receiver Characteristics						
Bit Rate	BR	Gbps	8.5	25.78125		
Bit Error Rate	BER		-	-	E-12	
Damage threshold	DT	dBm	3.4	-	-	
Overload Input Optical Power	PIN	dBm	2.4	-	-	2
Center Wavelength Range	λ_c	nm	820	-	880	
Receiver Sensitivity in Average Power	Sen	dBm	-	-	-5.2	3
LOS De-Assert	LosA	dBm	-30	-	-	
LOS Assert	LosD	dBm	-	-	-13	
LOS Hysteresis	LosH	dBm	0.5			

Note:

1. Coupled into 50/125 MMF.
2. Measured with PRBS $2^{31}-1$ test pattern @25.78125Gbps.BER=E-12
3. BER= 1×10^{-12} ; PRBS $2^{31}-1$ @25.78125Gbps.

Pin Descriptions

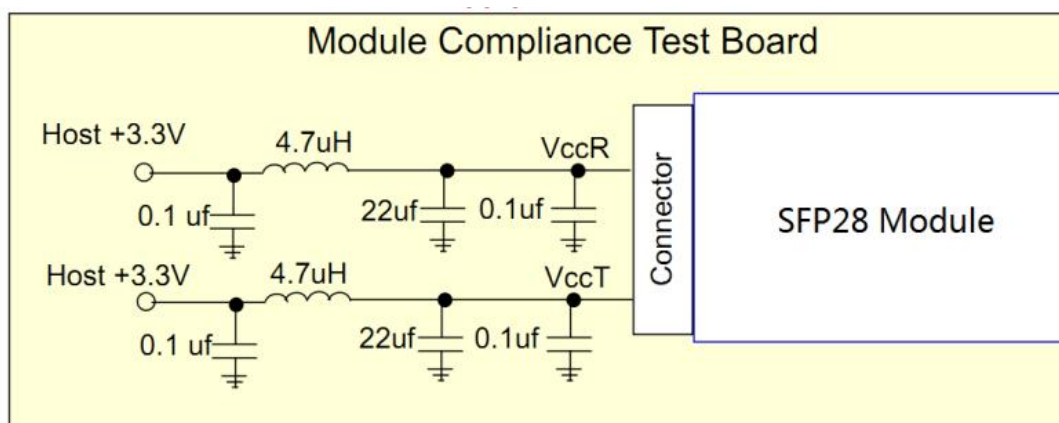


Figure 1, Recommended Host Board Power Supply Circuit

Recommended Interface Circuit

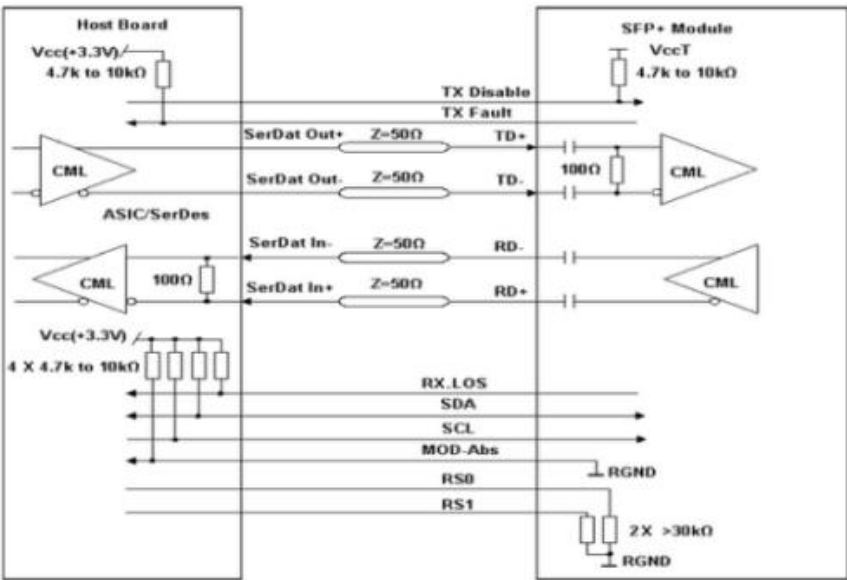


Figure 2, Recommended Interface Circuit

Pin arrangement

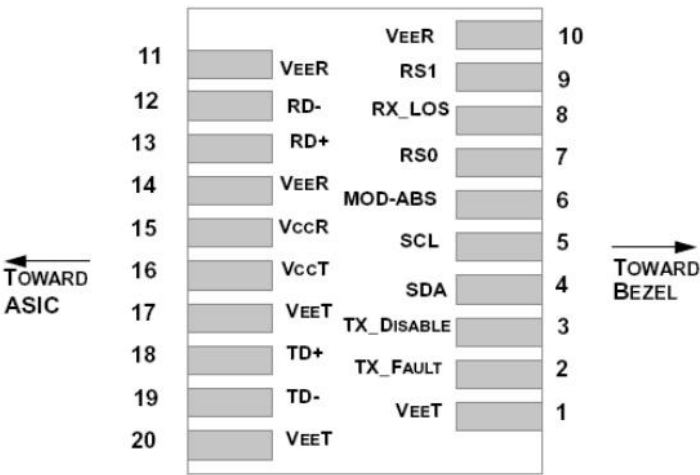


Figure 3, Pin View

Table 5-Pin Function Definitions

PIN	Name	Function	Notes
1	VeeT	Module transmitter ground	1
2	Tx Fault	Module transmitter fault	2
3	Tx Disable	Transmitter Disable; Turns off transmitter laser output	3
4	SDL	2-Wire Serial Interface Data Line (MOD-DEF2)	
5	SCL	2-Wire Serial Interface Clock (MOD-DEF1)	

6	MOD-ABS	Module Absent, connect to VeeR or VeeT in the module	2
7	RS0	Rate Select 0, optionally controls SFP+ module receiver	4
8	RX_LOS	Receiver Loss of Signal Indication (In FC designated as Rx_LOS and in Ethernet designated as NOT Signal Detect)	2
9	RS1	Rate Select 1, optionally controls SFP+ module transmitter	4
10	VeeR	Module receiver ground	1
11	VeeR	Module receiver ground	1
12	RD-	Receiver inverted data out put	
13	RD+	Receiver non-inverted data out put	
14	VeeR	Module receiver ground	1
15	VccR	Module receiver 3.3V supply	
16	VccT	Module transmitter 3.3V supply	
17	VeeT	Module transmitter ground	1
18	TD+	Transmitter inverted data out put	
19	TD-	Transmitter non-inverted data out put	
20	VeeT	Module transmitter ground	1

Note:

1. The module ground pins are isolated from the module case.
2. The pins shall be pulled up with 4.7K-10Kohms to a voltage between 3.14V and 3.46V on host board.
3. The pin is pulled up to VCC_T with a 4.7K-10K Ω resistor in the module.
4. See SFF-8472 Rev12.2 Table 10-2.

Mechanical Design Diagram

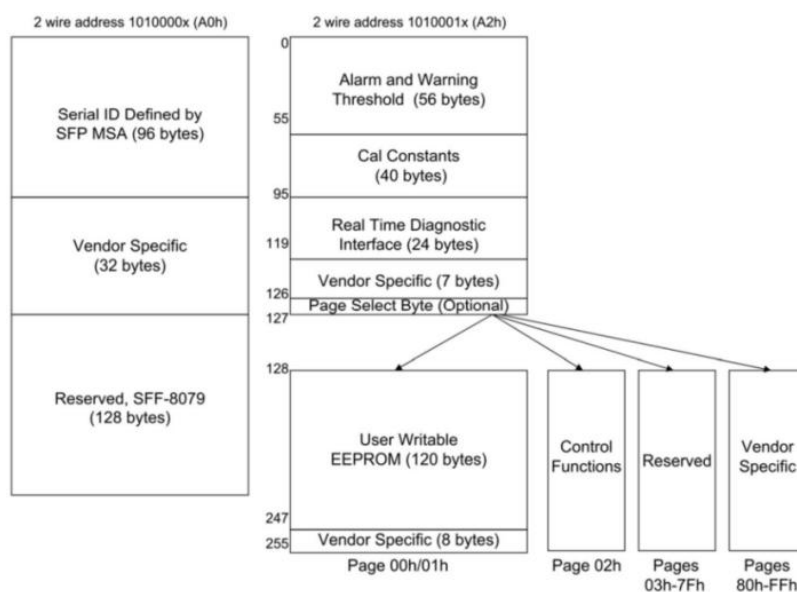
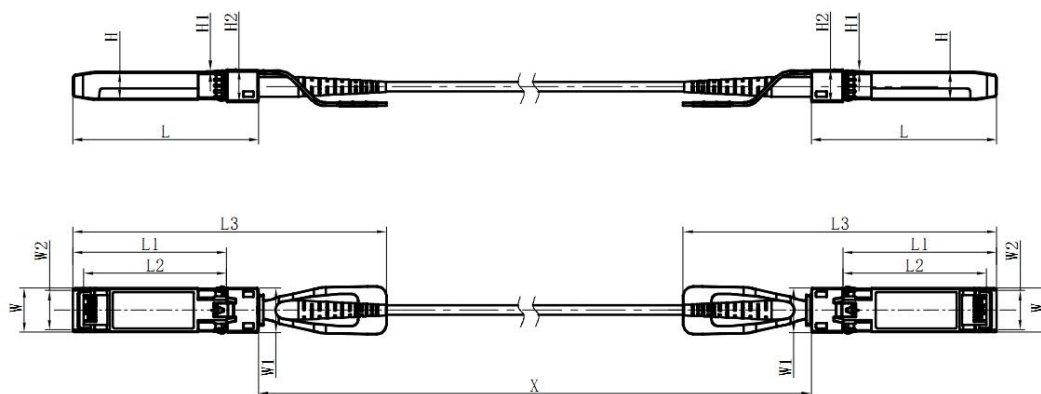


Figure 4, Memory Map

Mechanical



Unit: mm

	L	L1	L2	L3	W	W1	W2	H	H1	H2
MAX	57.75	48.0	44.65	102.5	13.75	14.0	12.25	8.65	0.55	10.4
Typical	57.55	47.8	44.45	101.5	13.65	13.9	12.15	8.55	0.5	10.2
MIN	57.35	47.6	44.25	100.5	13.55	13.8	12.05	8.45	0.45	10.0

Figure 5, Mechanical Diagram

Table 6-Cable Mechanical Specifications

Parameter	Value	Units
Diameter	3	mm
Minimum bend radius	30	mm
Length tolerance	Length < 1 m: +5 /-0	cm
	1 m ≤ length ≤ 4.5 m: +15 / -0	cm
	5 m ≤ length ≤ 14.5 m: +30 / -0	cm
	Length ≥ 15.0 m: +2% / -0	m
Cable color	Aqua(OM3),Megenta(OM4)	

Ordering information

Part No.	Bit Rate (Gbps)	Laser (nm)	Distance	Fiber Type	Connector	Temp
AOC-S4S4-xxx-C	25.78	850	0.5~100m	MMF	LC	0℃~+70℃

Revision History

Revision	Initiated	Approved	content	Revision History	Release Date
V1.0	HT.Huang	Nicky.Wen	Released	The latest version	Jul/2024

Further Information

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