10G SFP+ Active Optical Cables

1. Applications

- Datacom
- 10G Ethernet
- Other high-throughput data transmission network

2. Features

- 10Gb/s active optical cable up to 100m OM2 MMF
- 850nm VCSEL and PIN receiver
- Single 3.3V power supply
- Operating Case Temperature: -5~75℃
- Hot pluggable
- Low Power Consumption
- Light weight
- Small Bend Radius
- Digital Diagnostic Monitor(DDM)
- All-metal Housing for Superior EMI Performance

3. Description

Handar's SFP+ Active Optical Cable (AOC) is a 10Gbps solution to10G Ethernet, and datacenter. The integrated cable transmits 10Gbps data in each direction over MMF with distance up to 100m. The AOC is SFP+ MSA compliance, low power consumption and lightweight.

4. standard

- Compliant with SFF-8431 and SFF-8432
- Compliant with SFF-8472 Rev 10.2
- Compliant with IEEE 802.3ae 10GBASE-LR and 10GBASE-LW
- RoHS Compliant

5. Performance Specifications

5.1. Absolute Maximum Ratings

These values represent the damage threshold of the module. Stress in excess of any of the individual Absolute Maximum Ratings can cause immediate catastrophic damage to the module even if all other parameters are within Recommended Operating Conditions.

Table.1 Absolute maximum ratings

Parameter	Symbol	Min	Max	Units
Storage temperature	Ts	-20	85	℃
Relative Humidity	RH	5	85	%
Supply Voltage	Vc	-0.3	3.6	V
Supply Current	Icc		450	mA

5.2. Recommended Operating Conditions

Table.2 Recommended Operating Conditions

Parameter	Symbol	Min	Typical	Max	Unit
Operating Case Temperature	Standard Tc	0	25	70	°C
Power Supply Voltage	Vcc	3.13	3.3	3.47	V
Power Supply Current	Icc		60	260	mA
Power Dissipation	PD		600	800	mW
Data Rate	DR		10.3125		Gbps
Transmission Distance	TD			100	m

5.3. Transmitter Specification

Table.3 Transmitter Specification (Optical)

Parameter	Symbol	Min.	Typ.	Max.	Unit	Note
Average Output Power	Po	-5		-1	dBm	
Disable Power	Poff			-40	dBm	
Extinction Ratio	ER	3.5			dB	
Output Centre Wavelength	λc	840		860	nm	

Table.4 Transmitter Specification (Electrical)

Parameter		Symbol	Min	Typical	Max	Unit
Data Input Swing Differential		V_{IN}	200		700	mV
Input Differential Impedance		Z_{IN}	90	100	110	Ω
Transmit Disable Input	High	V_{IH}	2.0		V_{cc}+0.3	V
	Low	V_{IL}	0		0.8	V

5.4. Receiver Specification

Table.5 Receiver Specification (Optical)

Parameter	Symbol	Min	Typical	Max	Unit	note
Centre Wavelength	λc	840	850	860	nm	
Receiver Sensitivity	Sen			-11	dBm	1
Receiver Overload	Psat	0.5			dBm	1
LOS De-Assert	LOSD			-15	dBm	
LOS Assert	LOSA	-30			dBm	
LOS Hysteresis		0.5		4	dB	
Receiver Reflectance	Rrx			-12	dB	

Note :1. Measured at BER 10-12, 10.3Gbps, PRBS2^31-1, NRZ

Table.6 Receiver Specification (Electrical)

Parameter	Symbol	Min	Typical	Max	Unit	note
Data Output Swing Differential	Vout	300		800	mV	
Rx-Los Fault	Vlf	2.0		VccHOST	V	
Rx-Los Normal	Vln	0		0+0.8	V	
Output rise and fall time	Tr, Tf	28			ps	

5.5. Diagnostics Specification

Table.7Diagnostics Specification

Parameter	Range	Unit	Accuracy	Calibration
Temperature	0 to 70	℃	±3℃	Internal / External
Voltage	3.0 to 3.6	V	±3%	Internal / External
Bias Current	0 to 100	mA	±10%	Internal / External
TX Power	-5 to-1	dBm	±3dB	Internal / External
RX Power	-30to 0	dBm	±3dB	Internal / External

5.6. Pin Definitions

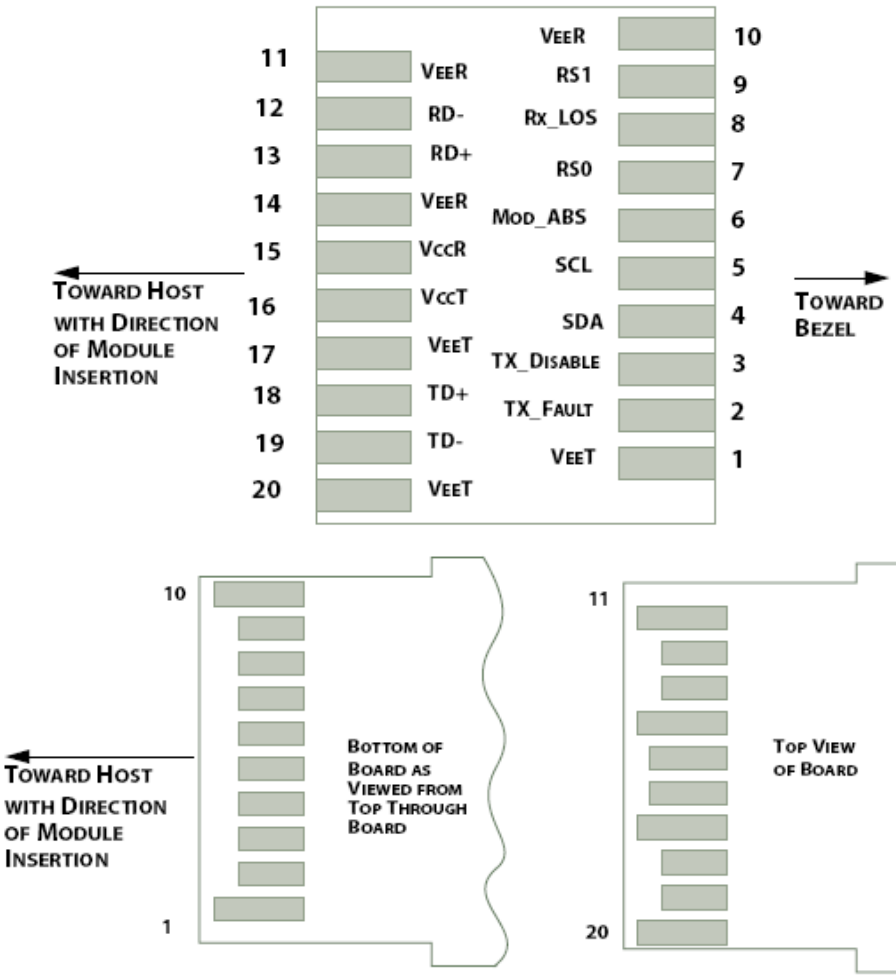
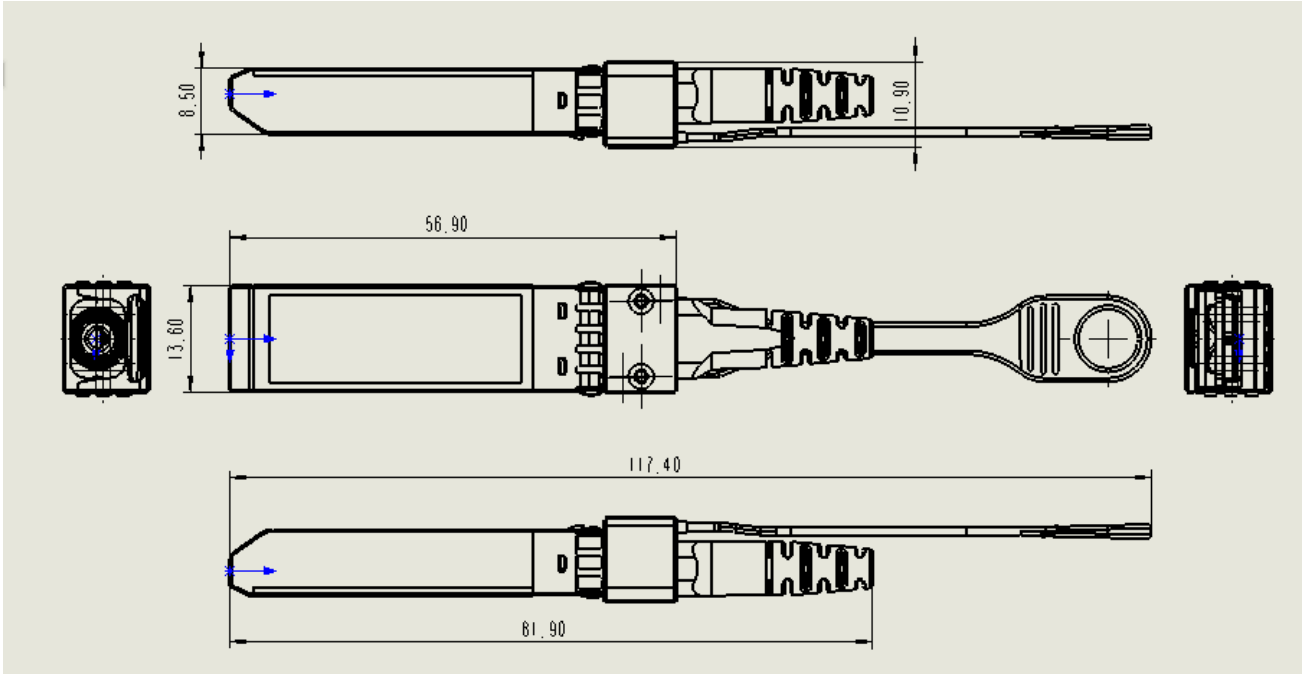


Table.8Pin Definitions

PIN	Symbol	Description	Remarks
1	$V_{EE}T$	Transmitter ground (common with receiver ground)	Circuit ground is isolatedfrom chassis ground

2	Tx_Fault	Transmitter Fault. Not supported	
3	Tx_Disable	Transmitter Disable. Laseroutput disable on high or open	Disabled: TDIS>2V or open Enabled: TDIS<0.8V
4	SDA	2-wire Serial Interface Data Line	Should Be pulled up with4.7k – 10kohm on hostboard to a voltage between2V and 3.6V
5	SCL	2-wire Serial Interface Clock Line	
6	M_{OD}_ABS	Module Absent. Grounded within the module.	
7	RS0	No connection required	
8	RX_LOS	Loss of Signal indication. Logic 0 indicates normal operation	LOS is open collector output
9	RS1	No connection required	
10	V_{EE}R	Receiver ground (common with transmitter ground)	Circuit ground is isolatedfrom chassis ground
11	V_{EE}R	Receiver ground (common with transmitter ground)	
12	RD–	Receiver Inverted DATA out. AC coupled	
13	RD+	Receiver Non-inverted DATA out. AC coupled	
14	V_{EE}R	Receiver ground (common with transmitter ground)	Circuit ground is isolatedfrom chassis ground
15	V_{CC}R	Receiver power supply	
16	V_{CC}T	Transmitter power supply	
17	V_{EE}T	Transmitter ground (common with receiver ground)	Circuit ground is isolatedfrom chassis ground
18	TD+	Transmitter Non-Inverted DATA in. AC coupled	
19	TD–	Transmitter Inverted DATA in. AC coupled	
20	V_{EE}T	Transmitter ground (common with receiver ground)	Circuit ground is isolatedfrom chassis ground

5.9. Mechanical Dimensions



6. Application Cautions

6.1. ESD

This transceiver is specified as ESD threshold 1kV for high speed pins and 2kV for all other electrical input pins, tested per MIL-STD-883, Method 3015.4 /JESD22-A114-A (HBM). However, normal ESD precautions are still required during the handling of this module. This transceiver is shipped in ESD protective packaging. It should be removed from the packaging and handled only in an ESD protected environment.

6.2. LASER SAFTY

This is a Class 1 Laser Product according to IEC 60825-1:1993:+A1:1997+A2:2001. This product complies with 21 CFR 1040.10 and 1040.11 except for deviations pursuant to Laser Notice No. 50, dated (July 26, 2001)

7. Order Information

Part No.	Description	Rate	Length	Optical Mode
HD-SFP+/10G-AOC-1	10G SFP+ to 10G SFP+ AOC	10.3G	1 meter	OM2
HD-SFP+/10G-AOC-2	10G SFP+ to 10G SFP+ AOC	10.3G	2 meters	OM2
HD-SFP+/10G-AOC-3	10G SFP+ to 10G SFP+ AOC	10.3G	3 meters	OM2
HD-SFP+/10G-AOC-5	10G SFP+ to 10G SFP+ AOC	10.3G	5 meters	OM2
HD-SFP+/10G-AOC-7	10G SFP+ to 10G SFP+ AOC	10.3G	7 meters	OM2