
40G QSFP+ to 4x 10G SFP+ Fan-Out

Active Optical Cable (AOC)

Datasheet



General Description

Active Optical Cable (AOC) for 40G QSFP+ to 4x 10G SFP+ application is commonly known as a “fan-out” assembly which is a hybrid transition from a QSFP+ on one end to four individual SFP+ on the other. The QSFP+ to 4x SFP+ fan-out AOC offers four parallel, bi-directional channels each operating at up to 10.3125 Gbps. Using industry leading VCSEL technology, an advanced new light-engine design and bend insensitive multimode fiber, this AOC delivers exceptional cost and performance value for 10 and 40GbE applications at distances up to 100 meters.

Features

- Supports 40G to 10G Ethernet interoperability
- SFF-8436 QSFP+ compliant
- SFF-8431 SFP+ compliant
- 4 channels 850nm VCSEL array
- Less cabling to order and manage
- Lengths up to 100 meters
- 0 to 70°C case temperature operating range
- 3.3V power supply voltage

- Low power consumption < 1.5W
- RoHS Compliant

Applications

- Data Centers with 10GbE requirements with ToR and Aggregation Architectures
- Network Switch Manufacturers supporting 40/10 GbE
- Server Manufactures supporting 10/40 GbE
- Manufactures of 10GbE Host Card Adapters (HCA/NIC)
- System Integrators

Pin Function Definition

Pin Function Definition for SFP+

PIN	Logic	Symbol	Name / Description
1		VeeT	Module Transmitter Ground
2	LVTTL-O	TX_Fault	Module Transmitter Fault
3	LVTTL-I	Tx_Disable	Transmitter Disable; Turns off transmitter laser
4	LVTTL-I/O	SDA	2-Wire Serial Interface Data Line
5	LVTTL-I	SCL	2-Wire Serial Interface Clock
6		Mod_ABS	Module Absent, Connected to VeeT or VeeR in the module
7	LVTTL-I	RS0	Receiver Rate Select
8	LVTTL-O	RX_LOS	Receiver Loss of Signal Indication Active LOW
9	LVTTL-I	RS1	Transmitter Rate Select (not used)
10		VeeR	Module Receiver Ground
11		VeeR	Module Receiver Ground
12	CML-O	RD-	Receiver Inverted Data Output
13	CML-O	RD+	Receiver Data Output
14		VeeR	Module Receiver Ground
15		VccR	Module Receiver 3.3 V Supply
16		VccT	Module Receiver 3.3 V Supply
17		VeeT	Module Transmitter Ground
18	CML-I	TD+	Transmitter Non-Inverted Data Input
19	CML-I	TD-	Transmitter Inverted Data Input
20		VeeT	Module Transmitter Ground

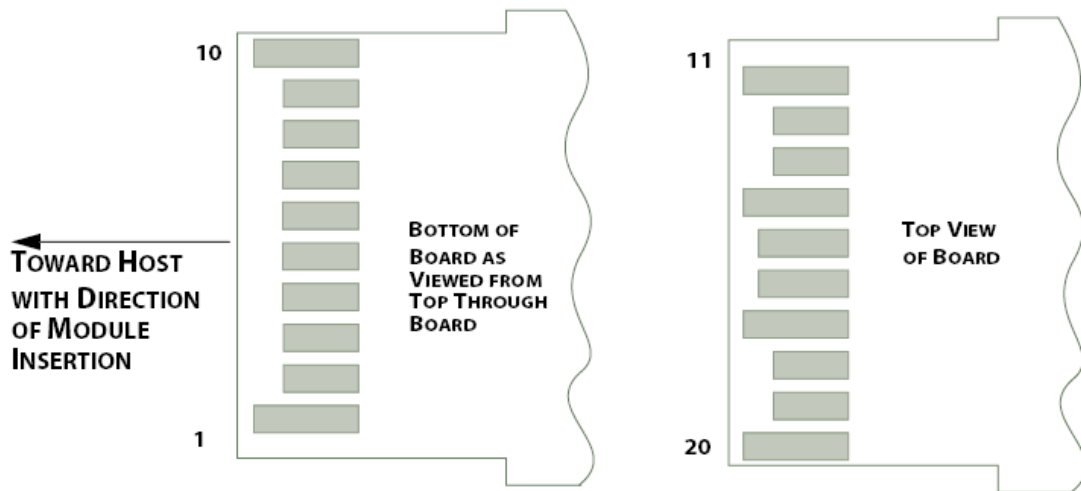


Figure 1 SFP+ contact assignment

Pin Function Definition for QSFP+

PIN	Logic	Symbol	Name/Description
1		GND	Ground
2	CML-I	Tx2n	Transmitter Inverted Data Input
3	CML-I	Tx2p	Transmitter Non-Inverted Data output
4		GND	Ground
5	CML-I	Tx4n	Transmitter Inverted Data Input
6	CML-I	Tx4p	Transmitter Non-Inverted Data output
7		GND	Ground
8	LVTLL-I	ModSelL	Module Select
9	LVTLL-I	ResetL	Module Reset
10		VccRx	+ 3.3V Power Supply Receiver
11	LVC MOS-I/O	SCL	2-Wire Serial Interface Clock
12	LVC MOS-I/O	SDA	2-Wire Serial Interface Data
13		GND	Ground
14	CML-O	Rx3p	Receiver Non-Inverted Data Output
15	CML-O	Rx3n	Receiver Inverted Data Output
16		GND	Ground
17	CML-O	Rx1p	Receiver Non-Inverted Data Output
18	CML-O	Rx1n	Receiver Inverted Data Output
19		GND	Ground
20		GND	Ground
21	CML-O	Rx2n	Receiver Inverted Data Output
22	CML-O	Rx2p	Receiver Non-Inverted Data Output
23		GND	Ground

24	CML-O	Rx4n	Receiver Inverted Data Output
25	CML-O	Rx4p	Receiver Non-Inverted Data Output
26		GND	Ground
27	LVTTL-O	ModPrsL	Module Present
28	LVTTL-O	IntL	Interrupt
29		VccTx	+3.3 V Power Supply transmitter
30		Vcc1	+3.3 V Power Supply
31	LVTTL-I	LPMMode	Low Power Mode
32		GND	Ground
33	CML-I	Tx3p	Transmitter Non-Inverted Data Input
34	CML-I	Tx3n	Transmitter Inverted Data Output
35		GND	Ground
36	CML-I	Tx1p	Transmitter Non-Inverted Data Input
37	CML-I	Tx1n	Transmitter Inverted Data Output
38		GND	Ground

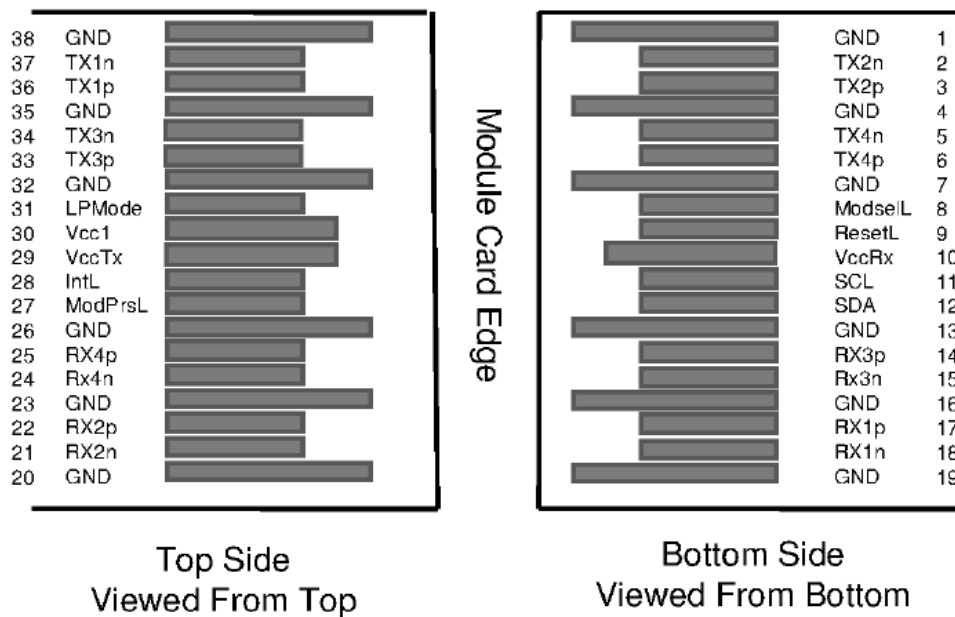


Figure 2: QSFP+ contact assignment

Absolute Ratings

Parameters	Symbol	Min.	Typical	Max	Unit
Power Supply Voltage	V_{CC}	3.135	3.3	3.465	V
Power Supply Current	I_{CC-SFP}		155	170	mA
	$I_{CC-QSFP}$			450	mA

Operating Case Temperature	T_C	0		70	°C
Storage Temperature	T_S	-40		85	°C
Relative Humidity	R_H	5		85	%

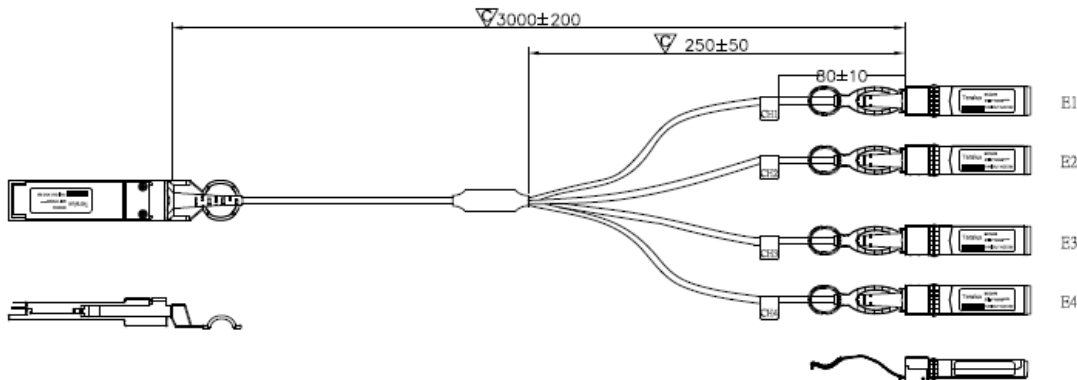
Electrical Specifications

Parameter	Symbol	Unit	Min	Typical	Max	Notes
Supply Voltage	V_{CCT}, V_{CCR}	V	3.135		3.465	
Power Supply Noise Tolerance		mV			66	
Bit Rate	BR	Gbps		10.3125		
Bit Error Ratio	BER				10^{-12}	
Transmitter(each lane)						
Input Differential Impedance	$R_{IN,P-P}$	Ω		100		
Differential Data Input Swing	$V_{IN,P-P}$	mV _{pp}	180		1200	
Tx Input Differential S-parameter (100 Ω Ref)	SDD11	dB			See 1	0.01 to 4.1 GHz
					See 2	4.1 to 11.1 GHz
Tx Input Differential to Common Mode Conversion (25 Ω Ref)	SCD11	dB			-10	0.01 to 11.1 GHz
Receiver(each lane)						
Differential Data Output Swing	$V_{OUT,P-P}$	mV _{pp}	300		850	
Output Rise and Fall Time	T_r, T_f	ps	28			
Rx Output Total Jitter	TJ	UI			0.65	
Rx Output 99% Jitter	DJ	UI			0.42	
Rx Output Differential S-Parameter (100 Ω Ref)	SDD22	dB			See 1	0.01 to 4.1 GHz
					See 2	4.1 to 11.1 GHz

						GHz
Rx Output Differential to Common Mode Conversion (25Ω Ref)	SCC22	dB			See 3	0.01 to 2.5 GHz
					-3	2.5 to 11.1 GHz
Receiver Output Eye Mask	Compliant with IEEE802.3 ba 2012 Table 86A-3					
1. Reflection Coefficient given by equation $SDD_{xx}(dB) < -12 + 2 \times \text{SQRT}(f)$, with f in GHz. 2. Reflection Coefficient given by equation $SDD_{xx}(dB) < -6.3 + 13 \times \log_{10}(f/5.5)$, with f in GHz 3. Reflection coefficient given by equation $SCC_{xx}(dB) < -7 + 1.6 \times f$, with f in GHz.						

Mechanical Specifications

The QSFP+ to 4x SFP+ AOC is compatible with the SFF 8432 specification for SFP+ Connector and SFF 8436 specification for QSFP+ Connector.



Regulatory Compliance

Feature	Test Method	Performance
Electrostatic Discharge (ESD) to the Electrical Pins	MIL-STD-883C Method 3015.7	Class 1 (>2000 Volts)
Electromagnetic Interference(EMI)	FCC Class B	Compliant with Standards
	CENELEC EN55022 Class B	
	CISPR22 ITE Class B	
RF Immunity	IEC61000-4-3	Typically Show no Measurable Effect from a 10V/m Field Swept from 80 to 1000MHz
RoHS Compliance	RoHS Directive 2011/65/EU and it's Amendment Directives 6/6	RoHS 6/6 compliant