

DATA SHEET

SFP-10G-AOCXM-BB SERIES

10G ACTIVE OPTICAL CABLE NETWORKING

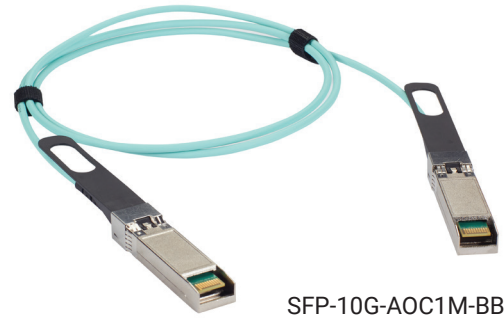
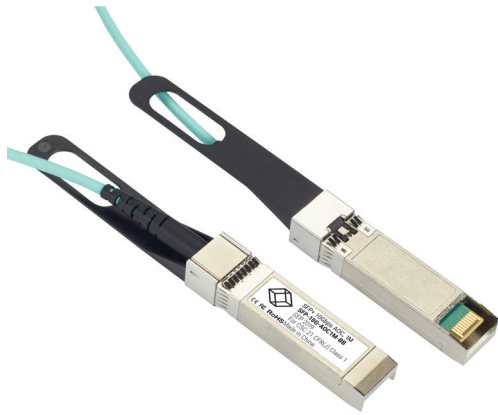
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BLACK BOX

OVERVIEW

10G ACTIVE OPTICAL CABLE FOR NETWORKING DATA SHEET



SFP-10G-AOC1M-BB

INTRODUCTION

Black Box SFP+ Active Optical Cables provide premium, error-free performance for data, storage, and high-performance computing (HPC) interconnectivity. 100% compatible to Cisco SFP-10G-AOCxM= Active Optical Cables, these cables connect your Cisco switches, routers and servers. Constructed for full compliance with the SFP+ Multi-Source Agreement (MSA) and SFF-8431 industry standards, you can also make connections among your non-Cisco, 10G compatible networking equipment. Programmed, tested and serialized to ensure compliance and functionality, Black Box Active Optical Cables are the ideal solution for 10G Ethernet, Infiniband (QDR, SDR, DDR), Fiber Channel applications and more.

Ultra-Thin and Light Design is Ideal for High-Density, High-Bandwidth Applications

Active Optical Cables are much thinner and lighter than their copper direct attach cable (DAC) counterparts, making them perfect for use in today's ultra-high density applications, where they take up less space and put less stress on equipment. The increase in space leads to increased air flow, saving you money on cooling overheated equipment. Also, optical technology provides significantly higher bandwidth than copper, allowing for ultra-fast data transmission at long distances, unlike DACs, which start to experience excessive bit error rates at over 16.4 feet (5 m).

All-in-One Solution Makes for Simple Connections with Low Latency

With an all-in-one, hot-swappable cable design, active optical cables provide you with an easy to connect solution that doesn't require purchasing multiple transceivers and cabling. The lack of additional connection points also means lower latency, so you can be confident of your data integrity. Hot-swappability makes upgrades and equipment replacements a breeze, minimizing downtime to your network. In addition, AOCs provide a cost-efficient, low-power solution (less than 0.6 W) that is essential in today's high data-rate applications.

Minimal EMI Profile

Active Optical Cables (AOC) feature a minimal EMI/RFI profile due to their fiber optic construction. Superior resistance to EMI/RFI interference ensures data integrity, which is essential in today's ultra-high density rackmount applications that cannot tolerate any signal downtime or interruption. And as security concerns continue to grow, fiber is well suited to provide protection against tapping of your data.

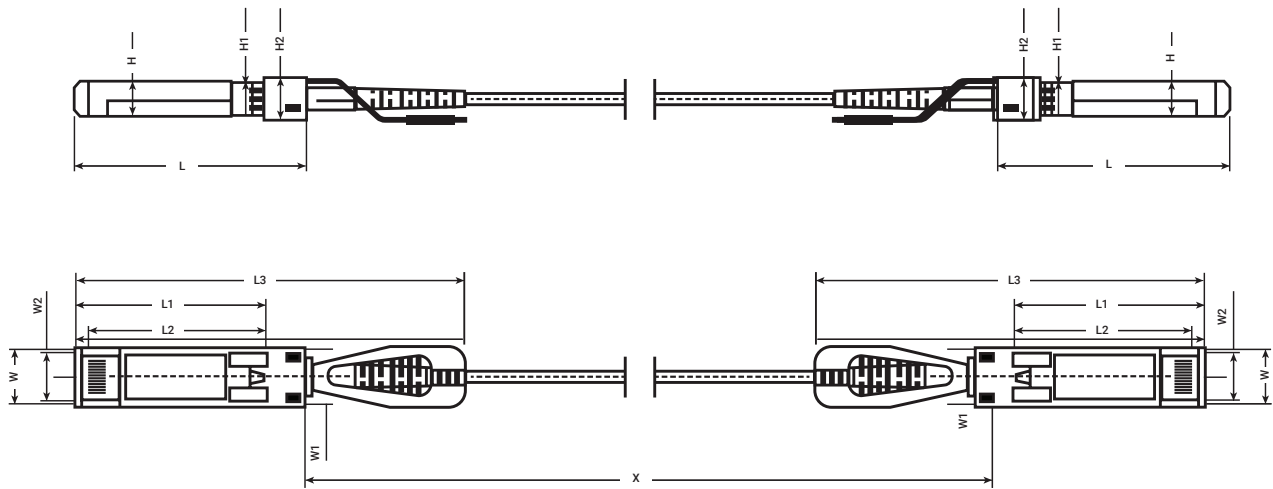
FEATURES

- 100% COMPATIBLE TO CISCO SFP-10G-AOCXM ACTIVE OPTICAL CABLES
- COMPLIES WITH SFP+ MULTI-SOURCE AGREEMENT (MSA) AND SFF-8431 STANDARDS
- USES VCSEL TECHNOLOGY OVER 850-NM MULTIMODE FIBER FOR OPTIMAL PERFORMANCE
- ULTRA-THIN AND LIGHT OPTICAL CABLING IDEAL FOR HIGH-DENSITY NETWORKING APPLICATIONS
- LOW POWER USAGE (LESS THAN 0.6 W) IS EXTREMELY VALUABLE IN HIGH DATA RATE APPLICATIONS
- PERFECT FOR POINT-TO-POINT, INTRA-RACK AND RACK-TO-RACK CONNECTIONS OF 10G EQUIPMENT
- CONSTRUCTED USING LSZH LOW-SMOKE ZERO HALOGEN CABLING
- SUPPORTS OPERATING TEMPERATURE RANGE OF 32 TO 158° F (0 TO 70° C)



DIMENSIONAL DIAGRAMS AND SPECIFICATIONS

10G ACTIVE OPTICAL CABLE FOR NETWORKING DATA SHEET



DIMENSIONS IN MILLIMETERS (MM)

	L	L1	L2	L3	W	W1	W2	H	H1	H2
MAXIMUM	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	0.50	10.2
MINIMUM	57.35	47.6	44.25	100.5	13.55	13.8	12.05	8.45	0.45	10.0

NOTE: X is the cable length (1, 2, 3, 5, 7, or 10 meters [m]).

ABSOLUTE MAXIMUM RATINGS

PARAMETER	SYMBOL	MIN.	TYPICAL	MAX	UNIT	NOTES
SUPPLY VOLTAGE	VCC3	-0.5	—	+3.6	V	—
STORAGE TEMPERATURE	Ts	-10	—	+70	°C	—
OPERATING HUMIDITY	RH	+5	—	+85	%	1
RECEIVER DAMAGE THRESHOLD	P Rdmg	+3.4	—	—	dBm	—

NOTE1: No condensation.

SPECIFICATIONS

10G ACTIVE OPTICAL CABLE FOR NETWORKING DATA SHEET

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	–	–	150	mA	–
POWER DISSIPATION	Pd	–	–	0.6	W	–
BIT RATE	BR	–	10.3125	–	Gbps	–
FIBER BEND RADIUS	Rb	3	–	–	cm	–

ELECTRICAL CHARACTERISTICS							
PARAMETER		SYMBOL	MIN.	TYPICAL	MAX	UNIT	NOTES
TRANSMITTER							
DIFFERENTIAL DATA INPUT SWING		Vin p-p	200	–	1600	mVPP	–
INPUT DIFFERENTIAL IMPEDANCE		ZIN	90	100	110	Ohms	–
TX_FAULT	NORMAL OPERATION	VCL	0	–	0.8	V	–
	TRANSMITTER FAULT	VCH	2.0	–	VCC	V	–
TX_DISABLE	NORMAL OPERATION	VIL	0	–	0.8	V	–
	LASER DISABLE	VIH	2.0	–	VCC±0.3	V	–
RECEIVER							
DIFFERENTIAL DATE OUTPUT		Vout	370	–	1600	mV	–
OUTPUT DIFFERENTIAL IMPEDANCE		ZD	90	100	110	Ohms	–
RX_LOS	NORMAL OPERATION	VOL	0	–	0.8	V	–
	LOSE SIGNAL	VOH	2.0	–	Vcc	V	–



SPECIFICATIONS

10G ACTIVE OPTICAL CABLE FOR NETWORKING DATA SHEET

OPTICAL CHARACTERISTICS						
PARAMETER	SYMBOL	MIN.	TYPICAL	MAX	UNIT	NOTES
OPTICAL TRANSMITTER CHARACTERISTICS						
DATA RATE	DR	9.953	10.3125	11.3	Gbps	—
CENTER WAVELENGTH RANGE	λ_c	820	850	880	nm	—
LASER OFF POWER	P _{off}	—	—	-45	dBm	—
LAUNCH OPTICAL POWER	P ₀	-6.0	—	—	dBm	—
EXTINCTION RATIO	ER	3	—	—	dB	—
SPECTRAL WIDTH (RMS)	RMS	—	—	0.45	nm	—
OPTICAL RECEIVER CHARACTERISTICS						
DATA RATE	DR	9.953	10.3125	11.3	Gbps	—
BIT ERROR RATE	BER	—	—	E-12	dBm	2
OVERLOAD INPUT OPTICAL POWER	PIN	2.4	—	—	dBm	2
CENTER WAVELENGTH RANGE	λ_c	820	—	880	nm	—
RECEIVER SENSITIVITY IN AVERAGE POWER	SEN	—	—	-9.9	dBm	—
LOS ASSERT	LosA	-26	—	—	dBm	—
LOS DE-ASSERT	LosD	—	—	-12	dBm	—
LOS HYSTERESIS	LosH	0.5	—	—	dB	—

NOTES:

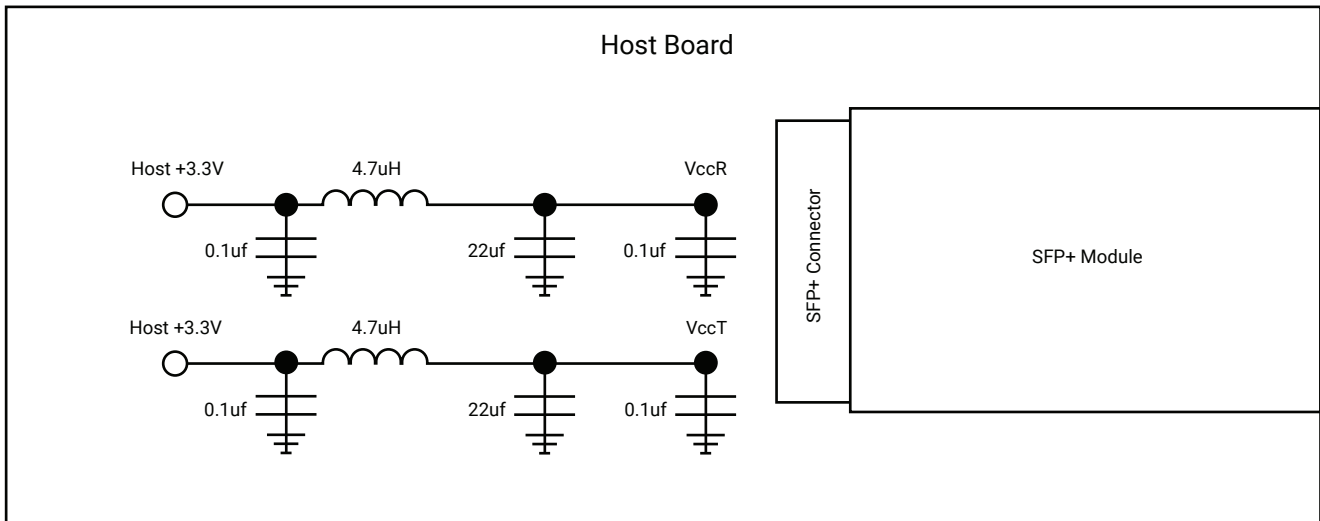
1. Coupled into 50/125 MMF.
2. Measured with PRBS 2³¹ -1 test pattern @10.3125 Gbps BER = 10E-12.



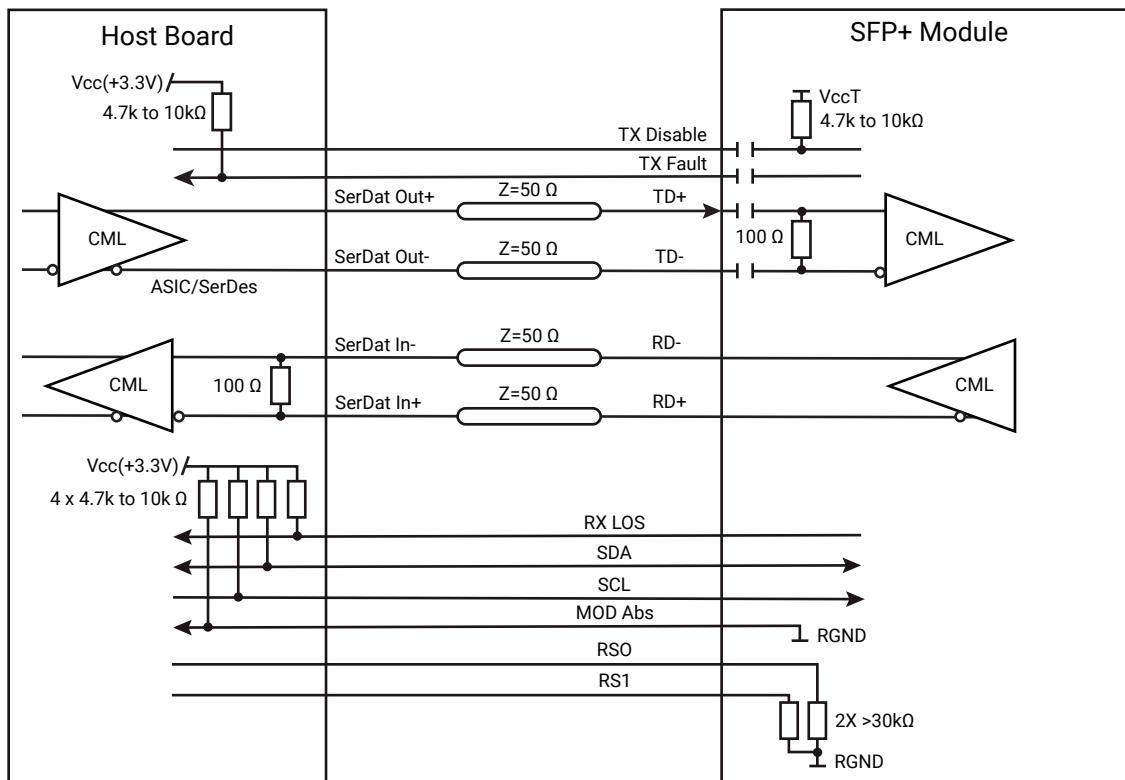
CIRCUIT DIAGRAMS

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RECOMMENDED HOST BOARD POWER SUPPLY CIRCUIT



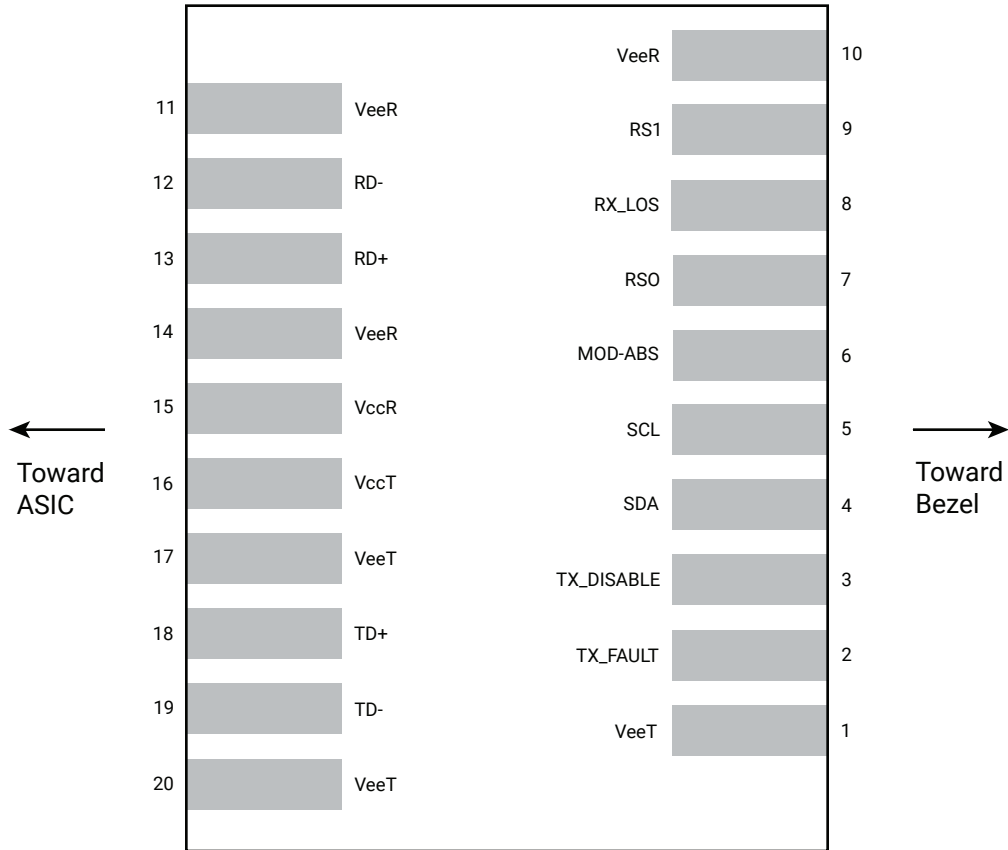
RECOMMENDED INTERFACE CIRCUIT



PIN FUNCTIONS

10G ACTIVE OPTICAL CABLE FOR NETWORKING DATA SHEET

PIN ARRANGEMENTS



PIN FUNCTIONS

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PIN FUNCTION DEFINITIONS			
PIN	SYMBOL	NAME/DESCRIPTION	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	SDA	2-wire Serial Interface Data Line (MOD-DEF2)	–
5	SCL	2-wire Serial Interface Clock (MOD-DEF1)	–
6	MOD_ABS	Module Absent, connected to VeeT or VeeR in the module	2
7	RS0	Rate Select 0, optionally controls SFP+ module receiver	–
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 STP+ module transmitter	–
10	VeeR	Module Receiver Ground	1
11	VeeR	Module Receiver Ground	1
12	RD-	Receiver Inverted Data Output	–
13	RD+	Receiver Non-Inverted Data Output	–
14	VeeR	Module Receiver Ground	1
15	VccR	Module Receiver 3.3 V Supply	–
16	VccT	Module Transmitter 3.3 V Supply	–
17	VeeT	Module Transmitter Ground	1
18	TD+	Transmitter Non-Inverted Data Input	–
19	TD-	Transmitter Inverted Data Input	–
20	VeeT	Module Transmitter Ground	1

NOTES:

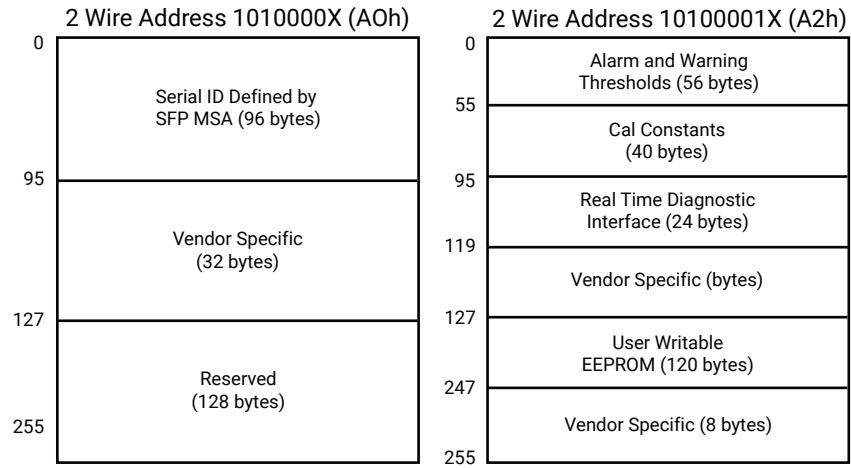
1. The module ground pins are isolated from the module case.
2. The pins shall be pulled up with 4.7 K–10 Kohms to a voltage between 3.14 V and 3.46 V on host board.
3. The pin is pulled up to VccT with a 4.7 K–10 Kohms resistor in the module.



SPECIFICATIONS

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MONITORING SPECIFICATION MEMORY MAP



CABLE MECHANICAL SPECIFICATIONS

PARAMETER	VALUE	UNITS
Diameter	3	mm
Minimum Bend Radius	30	mm
Length Tolerance	Length < 5 m: +300/-0 Length 5 m to 50 m: +500/-0 Length > 50 m: +1000/-0	mm
Cable Color	Aqua (OM3)	



SPECIFICATIONS AND ORDERING INFORMATION

10G ACTIVE OPTICAL CABLE FOR NETWORKING DATA SHEET

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CONNECTOR A	SFP+ male
CONNECTOR B	SFP+ male
CABLE JACKET TYPE	LSZH (Low-Smoke Zero Halogen)
COLOR	Aqua
FIBER GLASS TYPE	OM3
DATA TRANSFER RATE	10 Gbps
OPERATING TEMPERATURE	32 to 158° F (0 to 70 ° C)
STORAGE TEMPERATURE	14 to +158° F (-10 to +70° C)
POWER CONSUMPTION	Less than 0.6 W
STANDARDS	SFP+ MSA, SFF-8431
APPROVALS	RoHS, CE, FCC

LENGTH	MODEL
1-m	SFP-10G-AOC1M-BB
2-m	SFP-10G-AOC2M-BB
3-m	SFP-10G-AOC3M-BB
5-m	SFP-10G-AOC5M-BB
7-m	SFP-10G-AOC7M-BB
10-m	SFP-10G-AOC10M-BB

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