AOC Active Optical Cable Interface Requirements

Article Overview

Active Optical Cables (AOCs) are high-speed fiber-optic cables with integrated transceivers, supporting data rates from 10 Gbps up to 800 Gbps over distances ranging from 1 meter to 300 meters, depending on the application and form factor.

Overview

Active Optical Cables integrate electrical-to-optical (E-O) and optical-to-electrical (O-E) converters within the cable connectors, allowing standard electrical interfaces to transmit data over optical fiber. This design provides longer reach, improved signal integrity, and immunity to electromagnetic interference (EMI/RFI) compared to copper cables, while maintaining plug-and-play compatibility with standard form factors such as SFP+, QSFP+, QSFP28, QSFP-DD, OSFP, Mini-SAS HD, and USB Type-C .

Data Rates and Protocol Support

o Ethernet: 10 Gbps, 40 Gbps, 56 Gbps, up to 400 Gbps
o Fibre Channel: 8 Gbps, 10 Gbps
o InfiniBand: DDR, QDR, FDR
o SAS: SAS 3.0 (12 Gbps), SAS 4.0 (24 Gbps) for Mini-SAS HD AOCs
o PCIe: Gen 3 (8 Gbps) and Gen 4 (16 Gbps) support
o USB Type-C: Up to 10 Gbps, extending standard USB-C protocol up to 15 meters

Transmission Distance

o Short-range data center applications: 1-100 meters for multi-mode fiber (MMF) AOCs
o Extended USB Type-C applications: up to 15 meters with guaranteed performance
o High-performance configurations: some AOCs can reach up to 300 meters

Electrical and Optical Characteristics

o Power consumption: Typically lower than equivalent copper solutions, with integrated active circuits for signal amplification
o Bit Error Rate (BER): <=10^-12 for high-speed SFP+ and QSFP+ AOCs
o Optical fiber: Multi-mode fiber is commonly used for data center applications, providing minimal attenuation and high bandwidth
o Laser sources: VCSELs or laser diodes convert electrical signals to optical signals at the transmit end, while photodiodes convert them back at the receive end

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Form Factors and Connectors

o SFP+ for 10 Gbps short-range links
o QSFP+, QSFP28, QSFP-DD, OSFP for 40-400 Gbps high-density applications
o Mini-SAS HD and CXP2 for enterprise storage and high-speed server interconnects
o USB Type-C AOC for extending USB-C protocols over longer distances

Advantages

o High-speed transmission with low latency
o Longer reach than copper cables for equivalent data rates
o EMI/RFI immunity and enhanced security
o Lightweight and flexible, ideal for high-density environments
o Plug-and-play installation without additional transceivers or patch panels AOCs are widely used in data centers, HPC clusters, storage systems, and enterprise networking, providing a reliable, high-performance alternative to traditional copper cabling while supporting evolving high-speed protocols and standards .

What Are DAC Cables and AOC Cables In high-speed data center networking, interconnect solutions like Direct

This innovative design allows AOCs to accept standard electrical interfaces while leveraging the superior performance

Since active optical cables still require the same copper to photonic conversion at either end, many of the cost savings

To address most of your application scenarios, we provide the standard 10G AOC, 40G AOC, and faster speed 56G

Read here about the different types of AOC cables used in various applications, how to consider ports and

An AOC uses a section of optical fiber cable to connect two high-density connectors and relies on an external power

Designed to support data rates from 12G to 400G, AOCs integrate fiber-optic transceivers directly into the cable to

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AOC (Active Optical Cables) use optical fibers and active components, allowing for longer distances and higher data

AOC cables are high-speed cables that use optical fiber for transmission of data. AOCs have transceivers at both

AOC or Active Optical Cables can be described as a new way of transmitting data by leveraging the strength of

An AOC is an integrated assembly featuring fixed fiber optic cable ends terminated with pluggable connectors. Unlike

Freedom from Industry Standards: AOCs must comply to the IEEE, IBTA and SFF industry standards for the

Explore the world of active optical cables (AOC) in our comprehensive guide. Discover their role in high-speed data

Active Optical Cable offers high speed, low power use, and reliable connections. Find out how AOC fits data centers,

Why Use Active Optical Cable (AOC)? 1. Compared to Copper Cables Longer reach, using single mode

AOC stands for Active Optical Cable. It integrates an optical cable of a specified length with two optical modules to

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