RoHS-compliant carrier-grade router PAM4



Overview

RoHS-compliant carrier-grade router PAM4 Spec Sheet NVIDIA MMS4X00-NS400 400Gb/s Single-port OSFP Single Mode QSFP28 PAM4 DWDM: A Solution for Extending 20.

Key Takeaways

Carrier-grade routers using PAM4 technology enable high-speed, energy-efficient data transmission while supporting RoHS compliance for environmentally safe deployment. PAM4 Technology OverviewPAM4 (Pulse Amplitude Modulation with 4 levels) encodes two bits per symbol using four distinct voltage levels, effectively doubling the data rate compared to traditional NRZ signaling at the same baud rate. This makes PAM4 ideal for high-speed interfaces such as 50GE, 200GE, 400GE, and beyond, commonly used in carrier-grade routers and optical interconnects.

PAM4 is widely adopted in both optical and copper interconnects, including backplanes, midplanes, and pluggable transceivers, enabling dense, high-capacity networking for 5G, cloud, and AI workloads. Key Components for PAM4 RoutersPAM4 Drivers and Modulators: High-speed drivers like MACOM's MAOM-025408 Mach-Zehnder and MAOM-022404 EML drivers support 400G per lane PAM4 transmission, offering high RF bandwidth (>120 GHz), linearity, and low power consumption for silicon photonics, EML, and TFLN modulators. These drivers simplify integration and reduce BOM costs.

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PAM4 DSPs: Solutions like the Marvell Ara PAM4 DSP provide octal 200Gbps/lane optical interfaces and integrated high-swing laser-modulator drivers. They support advanced diagnostics, FEC, and loopback features, making them suitable for 1. 6T/800G data center interconnects and carrier-grade networking modules.

Redrivers and Equalizers: Devices such as the TI DS560MB410 extend the reach of high-speed serial links over backplanes and active copper cables. They provide channel equalization, low jitter, and failover redundancy, which are critical for maintaining signal integrity in carrier-grade deployments. RoHS Compliance ConsiderationsRoHS (Restriction of Hazardous Substances) compliance ensures that routers and their components limit hazardous materials such as lead, mercury, and cadmium.

Most modern PAM4 drivers, DSPs, and redrivers from major vendors are manufactured under ISO14001 environmental management standards, supporting RoHS compliance. When selecting a carrier-grade router, verify that all optical modules, PCBs, and semiconductor components meet RoHS requirements to ensure regulatory compliance and environmental safety.

Applications in Carrier-

Grade RoutersHigh-Capacity Backbones: PAM4 enables 400G+ interfaces for core and aggregation routers in telecom networks. 5G Mobile Networks: Efficient modulation reduces optical module costs while supporting high data traffic. Data Center Interconnects: PAM4 supports pluggable transceivers (OSFP, QSFP-DD) for scalable, high-speed interconnects.

SummaryRoHS-compliant carrier-grade routers leveraging PAM4 technology combine high-speed, energy-efficient data transmission with environmental safety. Key enabling components include high-bandwidth PAM4 drivers, DSPs with integrated modulation, and linear redrivers. These routers are suitable for 5G, cloud, and AI-driven networks, providing scalable, cost-effective, and compliant solutions for modern high-capacity networking.

Article Content

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Spec Sheet NVIDIA MMS4X00-NS400 400Gb/s Single-port OSFP Single Mode QSFP28 PAM4 DWDM: A Solution for Extending 200G QSFP56 FR4 PAM4 Optical Transceiver Pluggable IO interface

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RoHS Compliance

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Cisco Carrier Grade Services Engine Module Data Sheet

The Cisco ® Carrier-Grade Services Engine (CGSE) for the Cisco Carrier Routing System (CRS) is an ideal platform for these services. The Cisco CGSE is a single-slot module

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