Cleanroom Environment Fanless Sterile Switch - Official Technical Overview & Hardware Datasheet

EXECUTIVE SUMMARY

The Cleanroom Environment Fanless Sterile Switch represents a paradigm shift in network infrastructure for contamination-sensitive environments. Engineered specifically for semiconductor fabrication, pharmaceutical manufacturing, biotechnology research, and precision optics assembly, this platform eliminates particulate generation and electromagnetic interference (EMI) while delivering carrier-grade switching performance. By adopting a completely fanless thermal dissipation architecture combined with hermetically sealed, non-outgassing materials, the switch maintains ISO Class 3 (Class 1) cleanroom compliance and extends mean time between failures (MTBF) beyond 500,000 hours. This datasheet provides a comprehensive technical overview, performance specifications, and integration guidelines for network architects and facility engineers.

ARCHITECTURE & CHASSIS DESIGN

The platform employs a passive conductive cooling chassis milled from a single billet of aerospace-grade aluminum alloy (6061-T6), serving as both the structural foundation and primary heat sink. The internal backplane is a fully non-blocking, store-and-forward architecture with a switching fabric capacity of up to 2.56 Tbps. The unit is available in compact 1RU and high-density 2RU form factors, with a depth of 450mm to facilitate integration into standard 19-inch EIA racks. The chassis is coated with a proprietary, low-outgassing epoxy paint that passes NASA low-outgassing specifications (ASTM E595), ensuring zero volatile condensable materials (CVCM) are released into the cleanroom environment.

HARDWARE FEATURES

Passive Thermal Management: The system utilizes a heat-pipe array integrated directly into the chassis base, transferring thermal energy from the switching ASICs and PHYs to the finned external surfaces. This design achieves a thermal dissipation capacity of up to 150W without any moving parts, guaranteeing silent operation (0 dBA) and eliminating the primary source of airborne particulate contamination (bearing wear and air turbulence).

Sealed Port Interface: All SFP/SFP+/QSFP ports are equipped with factory-sealed, dust-tight protective covers and utilize a recessed cage design to prevent particle ingress. The switch supports a combination of 1/10/25/40/100 Gigabit Ethernet interfaces with support for both copper and optical transceivers. A specialized air-tight gasket system ensures the internal electronics remain isolated from the external environment.

Power Supply: The unit features a 1+1 redundant, hot-swappable power supply module (PSU) configuration. PSUs are fanless conduction-cooled units with an efficiency rating of >94% (80 PLUS Titanium equivalent) and support both AC (100-240V) and DC (-48V) input voltages. A power entry module with integrated EMI filtering is standard.

COMPLIANCE & STANDARDS

The switch is designed to meet the most stringent industry and regulatory standards for both networking and cleanroom environments. It fully complies with ISO 14644-1 for airborne particulate cleanliness (Class 3, equivalent to Federal Standard 209E Class 1), and IEST-RP-CC023 for electrostatic discharge (ESD) control in cleanrooms. For networking, the platform adheres to IEEE 802.3ae, 802.3ba, 802.3by, and 802.1Q standards, ensuring seamless interoperability with existing infrastructure. Regulatory approvals include UL 60950-1, IEC 60950-1, EN 55022 Class B (EMC), and FCC Part 15 Subpart B.

TECHNICAL SPECIFICATIONS

The following section details the operational limits, performance metrics, and physical parameters of the Cleanroom Environment Fanless Sterile Switch.

Parameter	**Specification**
Form Factor	1RU (1.75" H x 17.3" W x 17.7" D) / 2RU Chassis
Switching Capacity	Up to 2.56 Tbps (non-blocking)
Forwarding Rate	Up to 1,900 Mpps
MAC Address Table	Up to 128,000 entries
Power Supply	1+1 Redundant AC/DC

	(Hot-swappable, Fanless)
Operating Temperature	0°C to +45°C
Storage Temperature	-40°C to +70°C
Relative Humidity (Non-condensing)	5% to 95%
Maximum Power Consumption	120W (1RU) / 180W (2RU)
Noise Level	0 dBA (Passive Cooling)
MTBF	> 500,000 hours at 25°C
Cleanroom Compliance	ISO Class 3 (Class 1), IEST-RP-CC023
Weight (Fully populated)	6.8 kg (1RU) / 11.3 kg (2RU)

ORDERING OPTIONS

The platform is available in multiple configurations to match specific port density and uplink requirements, with all models sharing the same fanless chassis and cleanroom-certified construction. Part number nomenclature follows a systematic format: [CLEAN-SW]-[Port Count]-[Speed Grade]-[PSU Type].

- Base Model (CLEAN-SW-24G-2X-AC): 24 x 1G SFP ports + 2 x 10G SFP+ uplinks, AC PSU.
- High-Density Model (CLEAN-SW-48G-4X-AC): 48 x 1G SFP ports + 4 x 10G

SFP+ uplinks, AC PSU.

- Core Aggregation Model (CLEAN-SW-48X-2Q-DC): 48 x 10G SFP+ ports + 2 x 40G QSFP uplinks, DC PSU.

- High-Performance Model (CLEAN-SW-32X-2Q-AC): 32 x 25G SFP28 ports + 2 x 100G QSFP28 uplinks, AC PSU.

All models include a standard 5-year hardware warranty, lifetime software updates, and access to the OEM's global technical support network. Optional accessories include blanking panels, extended-depth mounting brackets, and a dedicated cleanroom installation kit (including lint-free wipes, ESD grounding straps, and a high-purity air duster).