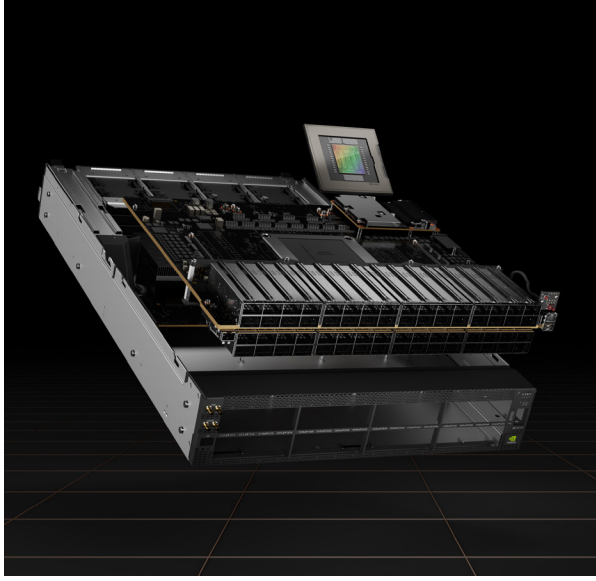
Datasheet

NVIDIA Spectrum SN5000 Series Switches

Bringing accelerated Ethernet to every data center for AI and cloud.



The NVIDIA Spectrum™ SN5000 series switches are the fifth generation of Spectrum Ethernet switches, purpose-built to accelerate data center fabrics. With port speeds spanning from 10 Gigabit Ethernet (GbE) to 800GbE, SN5000 series switches deliver accelerated Ethernet to every data center without compromising between performance and feature set.

The SN5000 series is ideal for enabling cloud-scale infrastructures for data centers of any size. SN5000 switch systems provide high performance, consistent low latency, and support for advanced data center networking features, making them ideal for cloud networks and end-to-end data center fabrics.

Powered by the NVIDIA Spectrum-4 ASIC, the SN5000 series features dynamic, flexible shared buffers and predictable performance. SN5000 switches are built to accelerate clouds and power NVIDIA platforms, including the NVIDIA Spectrum™-X networking platform, NVIDIA EGX™, NVIDIA DGX™, NVIDIA HGX™, and NVIDIA OVX™, and AI software tools such as NVIDIA AI Enterprise and NVIDIA LaunchPad.

As part of the Spectrum platform, SN5000 systems are pretested and prevalidated with NVIDIA's full portfolio of Ethernet networking technology, including NVIDIA® BlueField® data processing units (DPUs), ConnectX® smart network interface cards (SmartNICs), and LinkX® interconnects. While each element is fully compatible with standard Ethernet fabrics, the end-to-end switch-to-host solution is critical to powering accelerated workloads, delivering the high performance and innovative features needed to supercharge cloud-native applications at scale.

SN5000 switches are also a key component of the Spectrum-X networking platform. Spectrum-X, which features Spectrum-4 switches combined with BlueField-3 DPUs, is the world's first Ethernet fabric built for AI, accelerating generative AI performance by 1.7x over traditional Ethernet fabrics. Spectrum-X delivers consistent, predictable outcomes for thousands of simultaneous AI jobs at every scale through optimal resource utilization and performance isolation. Spectrum-X enables advanced cloud multi-tenancy as well as zero-trust security. With Spectrum-X, cloud service providers can accelerate the development, deployment, and time to market of AI solutions, while also improving return on investment.

Key Features

Performance

- Up to 800GbE per port for 51.2Tb/s aggregate switch bandwidth
- Fully shared packet buffer provides a fair, predictable, and high-bandwidth data path
- Consistent and low cut-through latency
- Accelerated RDMA over Converged Ethernet (RoCE) with extensions for AI cloud servers built on Ethernet
- Best-in-class VXLAN scale
- 512,000 shared forwarding entries flexibly shared across ACL, longest prefix match (LPM) routes, host routes, MAC, ECMP, and tunnel applications

SN5400 switch image

SN5600 switch image

Flexible, High-Performance Configuration

With a bidirectional switching capacity of 51.2Tb/s, SN5000 platforms are available in a range of configurations, each delivering high performance with feature-rich Layer 2 and Layer 3 forwarding, ideally suited for both leaf and spine and suitable for replacing modular chassis switches. SN5000 switches provide full wire speed performance with ultra-low cut-through latency leveraging the fully shared 160 MB packet buffers for fair and predictable performance. By combining the low latency of the Spectrum-4 ASIC with the large switch radix of SN5000 systems, thousands of hosts can be connected in a two-tier network architecture while maintaining minimal port-to-port latencies. Adding a wide range of innovations in the areas of programmability, telemetry, and tunneling, the NVIDIA SN5000 series is capable of addressing the complex networking requirements of today's data centers.

SN5400

The SN5400 smart-leaf/spine/super-spine offers 64 ports of 400GbE in a 2U form factor. The SN5400 offers diverse quad small form factor double density (QSFP-DD) connectivity in combinations from 1 to 400 GbE and boasts a total throughput of 25.6Tb/s, making it ideal for 400G data center fabrics.

SN5600

The SN5600 smart-leaf/spine/super-spine offers 64 ports of 800GbE in a dense 2U form factor. The SN5600 is ideal for Spectrum-X deployments and enables both standard leaf/spine designs with top-of-rack switches as well as end-of-row (EoR) topologies. The SN5600 offers diverse connectivity in combinations of 1 to 800GbE and boasts an industry-leading total throughput of 51.2Tb/s.

High Availability

SN5000 series switches are designed with the following hardware and software features for high availability:

- 1+1 hot-swappable power supplies and N+1 hot-swappable fans
- Color-coded power supply units (PSUs) and fans
- Ethernet VPN (EVPN) multi-homing
- Multi-chassis link aggregation (LAG) for active/active L2 multipathing
- Hardware Assisted In Service Software Upgrades (ISSU)
- 256-way equal-cost multi-path (ECMP) routing for load balancing and redundancy

Platform Security

SN5000 series switches offer a complete security suite at all switch layers. Hardware, firmware, and software are authenticated by a built-in root of trust, from the basic input/output system (BIOS) to the network operating system (NOS). Any attempt to run an altered/modified component or image that wasn't originally signed by NVIDIA is automatically blocked, ensuring the safest network installation within data centers.

Agility and Security

- Comprehensive Layer 2 and Layer 3
- Advanced network virtualization with high-performance, single-pass VXLAN routing
- Cloud-scale NAT
- Programmable pipeline that can programmatically parse, process, and edit packets
- Up to 12.8Tb/s MACsec VXLANsec encryption (available Q4 2023)
- Secured switch offerings via hardware root of trust

Visibility

- NVIDIA What Just Happened (WJH) telemetry dramatically reduces mean time to issue resolution
- Hardware-accelerated histograms powered by NetQ track and summarize queue depths at sub-microsecond granularity
- Inband network telemetry (INT)
- Streaming telemetry
- 512,000 on-chip flow counters

SN5000 Network Operating Systems

Two versions of SN5000 series switches are available out of the factory:

- Preinstalled with NVIDIA Cumulus® Linux, a revolutionary NOS, taking the Linux user experience from servers to switches and providing a rich routing functionality for large-scale applications.
- Bare metal, including Open Network Install Environment (ONIE) image, installable with any ONIE-mounted OS. ONIE-based platforms utilize the advantages of open networking and the Spectrum-4 ASIC capabilities.

NVIDIA Cumulus Linux

NVIDIA Cumulus Linux is a powerful open network operating system that enables advanced automation, customization, and scalability using web-scale principles hardened in the world's largest data centers. Cumulus Linux was built for building data center networks ideally suited to diverse business needs. And it's the only open NOS that enables the building of affordable and efficient network operations like the world's largest data center operators, unlocking web-scale networking for businesses of all sizes.

SONiC

Designed for hyperscalers, service providers, and enterprises, SONiC is a fully open-sourced, hardware-agnostic NOS, perfect for preventing vendor lock-in and ideal for next-generation data centers. SONiC's containerized design makes it flexible and customizable, allowing customers to combine and manage SONiC and non-SONiC switches within the same networking fabric. NVIDIA's Pure SONiC offering removes distribution limitations and enables enterprises to take full advantage of the benefits of open networking while adding the NVIDIA expertise and support that best guarantee success. NVIDIA is proud to guide the direction of SONiC as a member of the SONiC Governing Board and Technical Steering Committee. Pure SONiC is fully supported on all SN5000 switch systems.

Linux Switch

With Linux Switch, users can natively install and use any standard Linux distribution as the switch operating system. Linux Switch is based on a Linux kernel driver model for Ethernet switches (switchdev).

Platform Software Options

NVIDIA Air

The NVIDIA Air Infrastructure Simulation Platform creates digital twins of SN5000 switch systems (as well as the rest of the Spectrum portfolio). The digital twin includes logical instances of every switch and cable, so it can be used to validate security policy compliance, automation processes, monitoring tools, interoperability, and upgrade procedures. The digital twin is key to transforming network operations models, allowing IT architects and infrastructure specialists to deploy and update networks up to 95 percent faster through continuous integration and continuous delivery (CI/CD) integration.

NVIDIA NetQ

NVIDIA NetQ™ is a highly scalable network operations toolset that provides visibility, troubleshooting, and validation of networks in real time. NetQ delivers actionable insights and operational intelligence about the health of data center networks—from the container or host all the way to the switch and port—enabling a NetDevOps approach.

NetQ is the leading network operations tool that utilizes telemetry for deep troubleshooting, visibility, and automated workflows from a single interface, reducing mean time to innocence (MTTI) and network downtimes.

ONIE

ONIE is an Open Compute Project (OCP) open-source initiative driven by a community to define an open “install environment” for bare-metal network switches, such as the NVIDIA SN5000 series. ONIE enables a bare-metal network switch ecosystem where end users have a choice of different network operating systems.

NVIDIA Spectrum-4: An ASIC for Accelerated Data Centers

Groundbreaking Performance and Features

Packet buffer architecture has a major impact on overall switch performance. The Spectrum-4 ASIC features a fully shared and monolithic packet buffer across all ports, supporting cut-through traffic from all ports without compromising scale or features. With its fast packet buffer, Spectrum-4 provides a high-performance, fair, and bottleneck-free data path for mission-critical applications. In addition, Spectrum-4 provides the most advanced and innovative feature set yet. This includes unique features like RoCE extensions for Spectrum-X and end-to-end nanosecond-level timing precision from switch to host.

Centralized Visibility

Spectrum-4 provides deep and contextual network visibility, which allows network operators to proactively manage issues and reduce mean time to recovery (MTTR) and innocence (MTTI). Available through the switch SDK, NVIDIA User Experience (NVUE), or SONiC command-line interface (CLI), the NVIDIA What Just Happened® (WJH) feature leverages the underlying silicon and software capability to provide granular and event-triggered information about infrastructure issues. In addition, the rich telemetry information from Spectrum-4 is readily available via open APIs and tools such as gNMI that are integrable with NetQ, as well as third-party software tools and workflow engines.

Unprecedented Agility

For modern data center infrastructure to be software-defined and agile, both its compute and network building blocks need to be agile. Spectrum-4 includes a unique, feature-rich packet processing pipeline that offers data center network virtualization without compromising on performance or scale. Spectrum-4 has a programmable pipeline and a deep packet parser/editor that can process payloads up to the first 512 billion. Spectrum-4 supports single-pass Virtual Extensible LAN (VXLAN) routing and bridging. In addition, Spectrum-4 supports advanced virtualization features such as routing and network address translation (NAT).

Massive Scale

Spectrum-4 uses intelligent algorithms and efficient resource sharing and supports unprecedented scale for forwarding tables, counters, and policies. This fine-grained resource allocation enables Spectrum-4 to fit all specific needs, allowing up to 512,000 entries to be dynamically shared across media access control (MAC), Address Resolution Protocol (ARP), Internet Protocol version 4 (IPv4) routes, access control lists (ACLs), ECMP, and VXLAN tunnels.

Specifications

	SN5600	SN5400
Connectors	64 OSFP 800GbE + 1 SFP28 25GbE	64 QSFP-DD 400GbE + 2 SFP28 25GbE
Max. 800GbE Ports	64	-
Max. 400GbE Ports	128	64
Max. 200GbE Ports	256	128
Max. 100GbE Ports	256	256
Max. 50GbE Ports	256	256
Max. 40GbE Ports	128	128
Max. 25GbE Ports	256 + 1	256 + 2
Max. 10GbE Ports	256 + 1	256 + 2
Max. 1GbE Ports	1	2
Switching Capacity	51.2Tb/s	25.6Tb/s
Wire-Speed Switching	33.3Bpps	33.3Bpps
CPU	Hexa-core x86	Hexa-core x86
System Memory	32G	32G
SSD Memory	160GB	160GB
Packet Buffer	160MB	160MB
100/1000Mb/s Management Port	RJ45	RJ45
Serial Port	RJ45	RJ45
USB Port	USB Type 3	USB Type 3
Hot-Swap Power Supplies	2 (1+1 redundant)	2 (1+1 redundant)
Hot-Swappable Fans	4 (N+1 redundant)	4 (N+1 redundant)
Airflow	Reverse	Reverse
Power Supplies	Frequency: 50–60Hz Input range: 208–264AC	Frequency: 50–60Hz Input range: 208–264AC
Size (H x W x D)	3.39” x 17.2” x 28.3” (86.2mm x 438mm x 720mm)	3.39” x 17.2” x 28.3” (86.2mm x 438mm x 720mm)

Ordering Information

SN5600 Series SKUs	
920-9N42F-00RI-7N0	NVIDIA Spectrum-4-based 800GbE 2U open Ethernet switch with ONIE and NOS authentication, 64x OSFP ports and 1x SFP28 port, 2x power supplies (AC), x86 CPU, secure boot, standard depth, connector-to-power airflow, tool-less rail kit
920-9N42F-00RI-5N0	NVIDIA Spectrum-4-based 800GbE 2U open Ethernet switch with ONIE, 64x OSFP ports and 1x SFP28 port, 2x power supplies (AC), x86 CPU, secure boot capable, standard depth, connector-to-power airflow, tool-less rail kit
920-9N42F-00RI-7C0	NVIDIA Spectrum-4-based 800GbE 2U open Ethernet switch with Cumulus Linux authentication, 64x OSFP ports and 1x SFP28 port, 2x power supplies (AC), x86 CPU, secure boot, standard depth, connector-to-power airflow, tool-less rail kit

SN5400 Series SKUs	
920-9N42C-00RB-7N0	NVIDIA Spectrum-4-based 400GbE 2U open Ethernet switch with ONIE and NOS authentication, 64x QSFP56-DD ports and 2x SFP28 ports, 2x power supplies (AC), x86 CPU, secure boot, standard depth, connector-to-power airflow, tool-less rail kit
920-9N42C-00RB-5N0	NVIDIA Spectrum-4-based 400GbE 2U open Ethernet switch with ONIE, 64x QSFP-DD ports and 2x SFP28 ports, 2x power supplies (AC), x86 CPU, secure boot capable, standard depth, connector-to-power airflow, tool-less rail kit
920-9N42C-00RB-7C0	NVIDIA Spectrum-4-based 400GbE 2U open Ethernet switch with Cumulus Linux authentication, 64x QSFP56-DD ports and 2x SFP28 ports, 2x power supplies (AC), x86 CPU, secure boot, standard depth, connector-to-power airflow, tool-less rail kit

OSFP Transceivers and Cables

Supported Transceivers and Cables	Type	Interface Type	Description	Legacy SKU	NVIDIA SKU
800GbE and Twin 400G OSFP	Transceiver	800G/Twin 400G, SM, OSFP	1310nm, Dual MPO/ APC, up to 100m	MMS4X00-NS	980-9I30H-00NM00
	Transceiver	800G/Twin 400G, SM, OSFP	1310nm, Dual MPO/ APC, up to 500m	MMS4X00-NM	980-9I30G-00NM00
	Transceiver	800G/Twin 400G, SM, OSFP	1310nm, LC-LC, 2xFR4 up to 2km	MMS4X50-NM	980-9I30L-00N000
	Transceiver	800G/Twin 400G, MM, OSFP	850nm, Dual MPO/ APC, up to 50m	MMA4Z00-NS	980-9I510-00NS00
	ACC Cable	800G/Twin 400G, OSFP	3m to 5m ACC	MCA4J80-N00X	980-9I60Q-00N0XX
	ACC Cable	Twin 400G to 2x 400G OSFP to 2x QSFP112	4m to 5m ACC	MCA7J65-N00X	980-9I81A-00N0XX
	ACC Cable	Twin 400G to 4x 200G OSFP to 4x QSFP112	4m to 5m ACC	MCA7J75-N00X	980-9I76L-00N0XX
	DAC Cable	800G/Twin 400G, OSFP	0.5m to 2m DAC	MCP4Y10-N0XX	980-9IA0F-00N0XX
	DAC Cable	Twin 400G to 2x 400G OSFP to 2x QSFP112	1m to 3m DAC	MCP7Y10-N0XX	980-9I929-00N0XX
	DAC Cable	Twin 400G to 4x 200G OSFP to 4x QSFP112	1m to 3m DAC	MCP7Y40-N00X	980-9I80C-00N0XX
	DAC Cable	Twin 200G to 2x 200G OSFP to 2x QSFP28	1m to 2m DAC	MCP7Y60-H00X	980-9I46L-00H00X
	Active Optical Cable	Twin 200G to 4x 100G (2x50) OSFP to 4x QSFP56	1m to 2m DAC	MCP7Y70-H00X	980-9I93N-00H00X
	Active Optical Cable	Twin 100G to 2x 100G OSFP to 2x QSFP28, DAC	1m to 2m DAC	MCP7Y60-H00X	980-9I46K-00H00X
	Active Optical Cable	Twin 200G to 2x 200G OSFP to 2x QSFP56	850nm, 3m to 50m AOC	MFA7U10-H0XX	980-9I11Z-00H0XX

QSFP Transceivers and Cables

Supported Transceivers and Cables	Type	Interface Type	Description	Legacy SKU	NVIDIA SKU
400GbE QSFP-DD	Transceiver	400G QSFP-DD	1310nm, MPO, DR4, up to 500m	MMS1V00-WM	980-9I16Y-00W00
	Transceiver	400G QSFP-DD	1310nm, LC-LC, FR4, up to 2km	MMS1V50-WM	980-9I160-00W000
	Transceiver	400G QSFP-DD	1310nm, LC-LC, LR4, up to 10km	MMS1V90-WR	980-9I363-00W000
	Transceiver	400G QSFP-DD	850nm, MPO16, SR8, up to 100m	T-DQ8FNS-N00-M	980-9I530-00W000
	DAC Cable	400G QSFP-DD to QSFP-DD	0.5m to 3m DAC	MCP1660-W0xxxxx	80-9I35O-00WXXX
	DAC Cable	400GbE to 2x 200GbE QSFP-DD to 2x QSFP56	1m to 3m DAC	MCP7H60-W0xxxxx	980-9IA3S-00WXXX
	DAC Cable	400GbE to 4x 100GbE QSFP-DD to 2x QSFP56	1m to 3m DAC	MCP7F60-W0xxxxx	980-9I48Y-00WXXX
200GbE QSFP56	Transceiver	200G QSFP56	850nm, MPO, SR4, up to 100m	MMA1T00-VS	980-9I20T-00V000
	Transceiver	200G QSFP56	1310nm, LC-LC, FR4, up to 2km	MMS1W50-HM	980-9I055-00H000
	DAC Cable	200G QSFP56 to QSFP56	0.5m to 3m DAC	MCP1650-V0xxxxx	980-9I54C-00VXXX
	DAC Cable	200GbE to 2x 100GbE QSFP56 to 2x QSFP56	1m to 3m DAC	MCP7H50-V0xxxxx	980-9I98H-00VXXX
	Active Optical Cable	200G QSFP56 to QSFP56	3m to 100m AOC	MFS1S00-Vxxxx	980-9I44P-00VXXX
	Active Optical Cable	200GbE to 2x 100GbE QSFP56 to 2x QSFP56	3m to 30m AOC	MFS1S50-Vxxxx	980-9I95Q-00VXXX
100GbE QSFP28	Transceiver	100G QSFP28	1310nm, LC-LC, LR4, up to 10km	MMA1L10-CR	980-9I17P-00CR00
	Transceiver	100G QSFP28	850nm, LC-LC, SR4 MPO/UPC, up to 100m	MMA1B00-C100D	980-9I149-00CS00
	Transceiver	100G QSFP28	1310nm, LC-LC, DR1, up to 500m	MMS1V70-CM	980-9I042-00C000
	Transceiver	100G QSFP28	1310nm, LC-LC, DR1, up to 2km	MMS1V70-CM	980-9I042-00C000
	Transceiver	100G QSFP28	1310nm, LC-LC, ER4, up to 40km	SPQ-CE-ER-CDFL-M	980-9I53X-00C000
	DAC Cable	100GbE QSFP28	0.5m-5m LSZH DAC	MCP1600-C003XXXX	980-9I6XX
	DAC Cable	100GbE to 2x 50GbE QSFP28 to 2x QSFP28	1m to 5m DAC	MCP7H00-G0XXXXX	980-9I99H-00CXXX
	DAC Cable	100GbE to 4x 25GbE QSFP28 to 4x SFP28	1m to 5m DAC	MCP7F00-A0XXXXX	980-9I644-00CXXX
	Adapter	100GbE to 25GbE QSFP28 to SFP28	QSA28 pluggable adapter	MAM1Q00A-QSA28	980-9I71G-00J000
	Active Optical Cable	100GbE to 4x 25GbE QSFP28 to 4x SFP28	3m to 30m AOC	MFA7A50-CXXXX	980-9I49R-00CXXX
	Active Optical Cable	100G QSFP28 to QSFP28	100BASE-AOC	MFA1A00-CXXXX	980-9I13xx

Supported Transceivers and Cables	Type	Interface Type	Description	Legacy SKU	NVIDIA SKU
40GbE QSFP	Adapter	40GbE to 10GbE QSFP+ to SFP+	QSA pluggable adapter	MAM1Q00A-QSA	980-9I71G-00J000
25GbE SFP28	DAC Cable	25 BASE-CR	0.5m–5m DAC	MCP2M00-A0xxxxxx	980-9I63xx
	Transceiver	25G SFP28	850nm, LC-LC, SR, up to 100m	MMA2P00-AS	980-9I595-00AM00-R
	Transceiver	25G SFP28	1310nm, LC-LC, LR, up to 10km	MMA2L20-AR	980-9I094-00AR00
10GbE SFP+	Transceiver	10G SFP+	850nm, LC-LC, SR, up to 300m	MFM1T02A-SR	930-9O000-0000-409
	Transceiver	10G SFP+	1310nm, LC-LC, LR, up to 10km	MFM1T02A-LR	930-9O000-0000-343

Compliance

Standards Compliance	
Safety	CB, CE, cTUVus, CU
EMC	CE, ICES, FCC, RCM, VCCI
Operating Conditions	Operating: 0ºC–40ºC; non-operating: -40ºC–70ºC
Relative Humidity	5%–85%
Operating Altitude	0–3,050m
RoHS	RoHS compliant

Ready to Get Started?

To learn more about NVIDIA Spectrum SN5000 switches, visit:
nvidia.com/en-us/networking/ethernet-switching

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