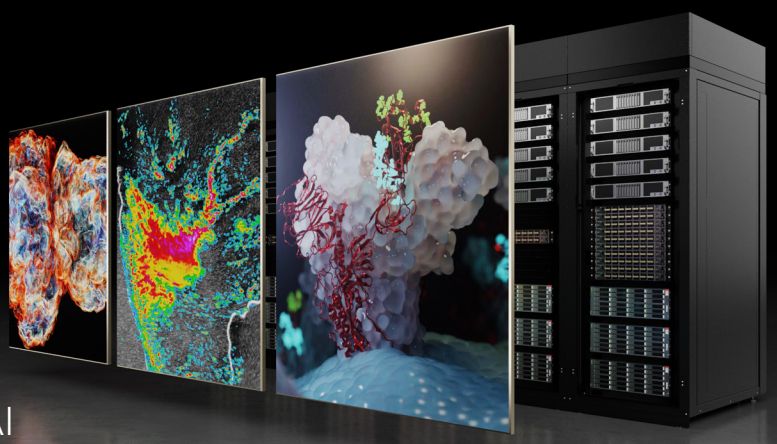
Datasheet



NVIDIA Quantum-2 InfiniBand Platform

Extreme Performance for Exascale AI

The NVIDIA® Quantum-2 InfiniBand platform provides AI developers and scientific researchers with the highest networking performance available to take on the world's most challenging problems. Innovative NVIDIA In-Network Computing acceleration engines provide ultra-low latency and double the data throughput, while delivering the scalability and feature-rich capabilities required for supercomputers, artificial intelligence, and hyperscale cloud data centers.

NVIDIA Quantum-2 enhances and extends In-Network Computing acceleration technology with preconfigured and programmable engines such as NVIDIA Scalable Hierarchical Aggregation and Reduction Protocol (SHARP)™, Message Passing Interface (MPI) tag matching, MPI_Alltoall, and programmable cores, as well as full transport offload with RDMA, GPUDirect RDMA, and GPUDirect Storage to deliver the best cost per node and return on investment (ROI).

World-Leading Performance

The NVIDIA Quantum-2 InfiniBand platform continues to set world records for high-performance networking, delivering 400Gb/s per port—2X higher bandwidth compared to the previous generation, 3X higher switch silicon port density, and the ability to connect over one million nodes at 400Gb/s in a 3-hop Dragonfly+ topology.

Featuring the third generation of NVIDIA SHARP technology, the platform allows virtually unlimited scalability for large data aggregation through the network—32X higher AI acceleration power compared to the previous generation. Moreover, the third generation of SHARP technology enables multiple tenants or multiple parallel applications to share the infrastructure without any performance degradation. MPI_Alltoall acceleration and MPI tag matching hardware engines, and other features like advanced congestion control, adaptive routing, and self-healing networking provide critical enhancements to high-performance computing (HPC) and AI clusters, enabling them to reach even higher levels of performance than before.

NVIDIA Quantum-2 Portfolio

NVIDIA Quantum-2 gives AI developers and scientific researchers the fastest networking performance and feature sets available to take on the world's most challenging problems. NVIDIA Quantum-2 empowers the world's leading supercomputing data centers with software-defined networking (SDN), In-Network Computing, performance isolation, advanced acceleration engines, remote direct memory access (RDMA), and the fastest speeds and feeds up to 400Gb/s.

Switches

NVIDIA Quantum-2 switches come with 64 400Gb/s ports on 32 physical octal small form-factor pluggable (OSFP) connectors that can be split to deliver up to 128 200Gb/s ports. The compact, 1U, fixed configuration switch offering includes internally managed and externally managed (aka unmanaged) versions. They carry an aggregated bidirectional throughput of 51.2 terabits per second (Tb/s), with a landmark capacity of more than 66.5 billion packets per second. As an ideal rack-mounted InfiniBand solution, the NVIDIA Quantum-2 switches allow maximum flexibility, enabling a variety of topologies, including Fat Tree, Dragonfly+, multi-dimensional Torus, and more.

Adapters

The NVIDIA ConnectX®-7 InfiniBand adapter (HCA) delivers 400Gb/s data throughput and supports 32 lanes of PCIe Gen5 or Gen4 for host connectivity. Built on the most advanced 100Gb/s-per-lane serializer/deserializer (SerDes) technology, 400Gb/s InfiniBand physical connectivity is based on OSFP connectors on both the switches and adapter endpoints. The popular ConnectX form factors meet the Card Electromechanical (CEM) Specification, with 16 lanes of PCIe Gen5. Some adapters come with the option to connect an additional 16-lane auxiliary card that leverages NVIDIA Socket Direct™ technology, to achieve 32 lanes of PCIe Gen4. Other form factors include Open Compute Project (OCP) 3.0 with OSFP connectors, OCP 3.0 with QSFP112 connectors, and CEM PCIe x16 with QSFP112 connectors.

The ConnectX-7 adapters deliver advanced In-Network Computing with MPI_Alltoall and MPI tag matching hardware engines, and other fabric enhancement features such as quality of service (QoS), congestion control, and more.

Transceivers and Cables

400Gb/s InfiniBand (NDR) connectivity provides the maximum flexibility to build a topology of choice, using connectorized transceivers with passive fiber cables, active copper cables (ACCs), and direct attached copper cables (DACs). The usage of MPO fiber cables enables the building of complex infrastructures and simpler installation, maintenance, and upgrades.

- The connector plugs/cages for 400Gb/s InfiniBand are the 8-channel and 4-channel octal small form-factor plug (OSFP) and the 4-channel, quad small form-factor plug 112G (QSFP112).
- Twin-port OSFP transceivers have two separate 400Gb/s NDR transceiver engines inside with two 4-channel, MPO/APC optical connectors. Both NDR connections can link to other switches as a pair at 800Gb/s aggregate, or as two separate 400Gb/s links to two switches, or two adapter/DPU adapter endpoints.
- Each 4-channel NDR port can be split into two 2-channel, 200Gb/s NDR200 ports using fiber splitter cables; this enables linking one switch cage device to four adapter/DPU endpoints.

- Similarly, switch-side, twin-port, copper DACs and ACCs are also offered in straight or 1:2 or 1:4 splitter cables with single-port OSFP or QSFP112 endpoints to adapters and DPUs.
- The air-cooled Quantum-2 switches only accept twin-port, finned-top, OSFP devices. DGX-H100 InfiniBand four OSFP cages only accept twin-port, flat-top, 800Gb/s transceivers and ACCs. HCAs and DPUs only use flat-top OSFP or QSFP112 devices.

The large selection of device combinations creates the following array of interconnect choices:

- Quantum-2 switches-to-HCAs and DPUs: switch-side, twin-port, 800Gb/s DACs, ACCs, and transceivers connect to the following devices:
  - Two 400Gb/s NDR
  - Four 200Gb/s NDR200
  - Single-port OSFP or QSFP112
- Connectivity to previous InfiniBand generations: Quantum-2 switch twin-port OSFP, 2xHDR DACs and AOCs splitter cables with QSFP56 connector endpoints enable:
  - Two 400Gb/s HDR, two 200Gb/s EDR, or four 100Gb/s HDR100 links to Quantum switches
  - ConnectX-6 HCAs
  - BlueField-2 DPUs
- Flat-top, twin-port, 800Gb/s transceivers and ACC cables can connect DGX-H100 Hopper GPU systems to Quantum-2 switches creating 400Gb/s NDR GPU compute fabrics, with minimum cabling.

UFM Cyber-AI

The NVIDIA Unified Fabric Manager (UFM) Cyber-AI platform offers enhanced and real-time network telemetry, together with AI-powered intelligence and advanced analytics. Enabling IT managers to discover operational anomalies and predict network failures, it improves security and data center uptime and decreases overall operating expenses.

Ordering Information

NVIDIA Quantum-2 Switches

Orderable Part Number (OPN)	Description
MQM9790-NS2F	NVIDIA Quantum-2-based 400Gb/s InfiniBand switch, 64 400Gb/s ports, 32 OSFP ports, non-blocking switching capacity of 51.2Tb/s, two power supplies (AC), standard depth, unmanaged, power-to-connector (P2C) airflow, rail kit
MQM9790-NS2R	NVIDIA Quantum-2-based 400Gb/s InfiniBand switch, 64 400Gb/s ports, 32 OSFP ports, non-blocking switching capacity of 51.2Tb/s, two power supplies (AC), standard depth, unmanaged, connector-to-power (C2P) airflow, rail kit
MQM9700-NS2F	NVIDIA Quantum-2-based 400Gb/s InfiniBand switch, 64 400Gb/s ports, 32 OSFP ports, non-blocking switching capacity of 51.2Tb/s, two power supplies (AC), standard depth, managed, P2C airflow, rail kit
MQM9700-NS2R	NVIDIA Quantum-2-based 400Gb/s InfiniBand switch, 64 400Gb/s ports, 32 OSFP ports, non-blocking switching capacity of 51.2Tb/s, two power supplies (AC), standard depth, managed, C2P airflow, rail kit

ConnectX-7 Adapters

PCIe Standup Adapters

Orderable Part Number (OPN)	Description
MCX755106AC-HEAT	NVIDIA ConnectX-7 HHHL adapter card, 200GbE (default mode) / NDR200 IB, dual-port QSFP112, PCIe 5.0 x16 with x16 PCIe extension option, crypto enabled, Secure Boot enabled, tall bracket
MCX755106AS-HEAT	NVIDIA ConnectX-7 HHHL adapter card, 200GbE (default mode) / NDR200 IB, dual-port QSFP112, PCIe 5.0 x16 with x16 PCIe extension option, crypto disabled, Secure Boot enabled, tall bracket
MCX75310AAC-NEAT	NVIDIA ConnectX-7 HHHL adapter card, 400GbE / NDR IB (default mode), single-port OSFP, PCIe 5.0 x16, crypto enabled, Secure Boot enabled, tall bracket
MCX75310AAS-NEAT	NVIDIA ConnectX-7 HHHL adapter card, 400GbE / NDR IB (default mode), single-port OSFP, PCIe 5.0 x16, crypto disabled, Secure Boot enabled, tall bracket
MCX75310AAS-HEAT	NVIDIA ConnectX-7 HHHL adapter card, 200GbE / NDR200 IB (default mode), single-port OSFP, PCIe 5.0 x16, crypto disabled, Secure Boot enabled, tall bracket
MCX75510AAS-NEAT	NVIDIA ConnectX-7 adapter card, 400Gb/s NDR IB, single-port OSFP, PCIe 5.0 with x16 extension option (Socket Direct ready), crypto disabled, Secure boot enabled, tall bracket
MCX75510AAS-HEAT	NVIDIA ConnectX-7 adapter card, 200Gb/s NDR200 IB, single-port OSFP, PCIe 5.0 with x16 extension option (Socket Direct ready), crypto disabled, Secure boot enabled, tall bracket

Auxiliary Cards

Orderable Part Number (OPN)	Description
MTMK9100-T15	NVIDIA auxiliary kit for additional PCIe Gen4 x16 connection, PCIe Gen4 x16 passive auxiliary card, two 150 millimeter (mm) IPEX cables
MTMKI9100-T25	NVIDIA auxiliary kit for additional PCIe Gen4 x16 connection, PCIe Gen4 x16 passive auxiliary card, two 250mm IPEX cables
MTMK9100-T35	NVIDIA auxiliary kit for additional PCIe Gen4 x16 connection, PCIe Gen4 x16 passive auxiliary card, two 350mm IPEX cables

Open Compute Project (OCP) Adapters

Orderable Part Number (OPN)	Description
MCX753436MC-HEAB	NVIDIA ConnectX-7 OCP3.0 SFF adapter card, 200GbE (default mode) / NDR200 IB, dual-port QSFP112, multi-host and Socket Direct capable, PCIe 5.0 x16, crypto-enabled, Secure Boot enabled, thumbscrew (pull tab) bracket
MCX753436MS-HEAB	NVIDIA ConnectX-7 OCP3.0 SFF adapter card, 200GbE (default mode) / NDR200 IB, dual-port QSFP112, multi-host and Socket Direct capable, PCIe 5.0 x16, crypto-disabled, Secure Boot enabled, thumbscrew (pull tab) bracket
MCX75343AMS-NEAC	NVIDIA ConnectX-7 OCP3.0 TSFF adapter card,400GbE / NDR IB (default mode,, single-port OSFP, Multi-Host and Socket Direct capable, PCIe 5.0 x16, crypto-disabled, Secure Boot enabled, thumbscrew (pull tab) TSFF bracket
MCX75343AMC-NEAC	NVIDIA ConnectX-7 OCP3.0 TSFF adapter card,400GbE / NDR IB (default mode,, single-port OSFP, Multi-Host and Socket Direct capable, PCIe 5.0 x16, crypto-enabledd, Secure Boot enabled, thumbscrew (pull tab) TSFF bracket

Transceivers and Cables

Transceivers for Air-Cooled Quantum-2 Switches

Orderable Part Number (Opn)	Description
Multimode Transceivers	
MMA4Z00-NS	NVIDIA twin-port 850nm transceiver, 800Gb/s, 2x NDR, 2x SR4, finned-top OSFP, 2x MPO/APC, up to 50m (switch-side, air-cooled)
MMA4Z00-NS-FLT	NVIDIA twin-port 850nm transceiver, 800Gb/s, 2x NDR, 2x SR4, flat-top OSFP, 2x MPO/APC, up to 50m (for liquid-cooled switches and DGX-H100)
MMA4Z00-NS400	NVIDIA single-port 850nm transceiver, 400Gb/s, NDR, SR4, flat-top OSFP, MPO/APC, up to 50m (for OSFP HCAs)
MMA1Z00-NS400	NVIDIA single-port 850nm transceiver, 400Gb/s, NDR, SR4, flat-top QSFP112, MPO/APC, up to 50m (for HCA/DPUs)
Single-Mode Transceivers	
MMS4X00-NM	NVIDIA twin-port 1310nm transceiver, 800Gb/s, 2x NDR, 2x DR4, finned-top OSFP, 2x MPO/APC, up to 500m (switch-side, air-cooled)
MMS4X00-NS	NVIDIA twin-port 1310nm transceiver, 800Gb/s, 2x NDR, 2x DR4, finned-top OSFP, 2x MPO/APC, up to 100m (switch-side, air-cooled)
MMS4X00-NM-FLT	NVIDIA twin-port 1310nm transceiver, 800Gb/s, 2x NDR, 2x DR4, flat-top OSFP, 2x MPO/APC, up to 500m (liquid-cooled switches and DGX-H100)
MMS4X00-NS-FLT	NVIDIA twin-port 1310nm transceiver, 800Gb/s, 2x NDR, 2x DR4, flat-top OSFP, 2x MPO/APC, up to 100m (liquid-cooled switches and DGX-H100)
MMS4X00-NS400	NVIDIA single-port 1310nm transceiver, 400Gb/s, NDR, DR4, flat-top OSFP, MPO/APC, up to 100m (for OSFP HCAs)

MPO/APC Single-Mode Crossover Fiber

MFP7E30-Nxxx	NVIDIA passive fiber cable, SMF, MPO to MPO, xxx indicates length in meters: 001, 002, 003, 005, 007, 010, 015, 020, 030, 040, 050, 060, 070, 100

MPO/APC Single-Mode Crossover Fiber Splitter

MFP7E40-Nxxx	NVIDIA passive fiber cable, SMF, MPO to 2x MPO, xxx indicates length in meters: 003, 005, 007, 010, 015, 020, 030, 040, 050

MPO/APC Multimode Crossover Fiber

MFP7E10-Nxxx	NVIDIA passive fiber cable, MMF, MPO to MPO, xxx indicates length in meters: 003, 005, 007, 010, 015, 020, 030, 040, 050

MPO/APC Multimode Crossover Fiber Splitter

MFP7E20-Nxxx	NVIDIA passive fiber cable, MMF, MPO to 2x MPO, xxx indicates length in meters: 003, 005, 007, 010, 015, 020, 030, 050

Direct Attached Copper (DAC) Switch to Switch OSFP

MCP4Y10-Nxxx	NVIDIA passive copper cable, InfiniBand NDR 800Gb/s to 800Gb/s, OSFP to OSFP, xxx indicates length in meters: 00A (0.5m), 00B (0.75m), 001, 002

Direct Attached Copper (DAC) Switch to ConnectX-7 HCA OSFP

MCP7Y00-Nxxx	NVIDIA passive copper splitter cable, InfiniBand NDR 800Gb/s to 2x 400Gb/s, OSFP to 2x OSFP xxx indicates length in meters: 001, 01A (1.5m), 002, 02A (2.5m), 003
MCP7Y50-Nxxx	NVIDIA passive copper splitter cable, InfiniBand NDR 800Gb/s to 4x 200Gb/s, OSFP to 4x OSFP xxx indicates length in meters: 001, 01A (1.5m), 002, 02A (2.5m), 003

Direct Attached Copper (DAC) Switch to BlueField-3 DPU QSFP112

MCP7Y10-Nxxx	NVIDIA passive copper splitter cable, InfiniBand NDR 800Gb/s to 2x 400Gb/s, OSFP to 2x QSFP112 xxx indicates length in meters: 001, 01A (1.5m), 002, 02A (2.5m), 003

Direct Attached Copper (DAC) Switch to ConnectX-7 HCA or BlueField-3 DPU QSFP112

MCP7Y40-Nxxx	**NVIDIA passive copper splitter cable, InfiniBand NDR 800Gb/s to 4x 200Gb/s, OSFP to 4x QSFP112** **xxx indicates length in meters: 001, 01A (1.5m), 002, 02A (2.5m), 003**

Active Copper (ACC) Switch to Switch OSFP

MCA4J80-Nxxx	**NVIDIA active copper cable, InfiniBand NDR 800Gb/s to 800Gb/s, OSFP to OSFP** **xxx indicates length in meters: 003, 004, 005**

Active Copper Cable (ACC) Switch to ConnectX-7 HCA OSFP

MCA7J60-Nxxx	**NVIDIA active copper splitter cable, InfiniBand NDR 800Gb/s to 2x 400Gb/s, OSFP to 2x OSFP** **xxx indicates length in meters: 004, 005**
MCA7J70-Nxxx	**NVIDIA active copper splitter cable, InfiniBand NDR 800Gb/s to 4x 200Gb/s, OSFP to 4x OSFP** **xxx indicates length in meters: 004, 005**

Active Copper Cable (ACC) Switch to BlueField-3 DPU QSFP112

MCA7J65-Nxxx	**NVIDIA active copper splitter cable, InfiniBand NDR 800Gb/s to 2x 400Gb/s, OSFP to 2x QSFP112** **xxx indicates length in meters: 004, 005**

Active Copper Cable (ACC) Switch to ConnectX-7 HCA or BlueField-3 DPU QSFP112

MCA7J75-Nxxx	**NVIDIA active copper splitter cable, InfiniBand NDR 800Gb/s to 4x 200Gb/s, OSFP to 4x QSFP112** **xxx indicates length in meters: 004, 005**

Backward-Compatible Active Optical Cable (AOC), 1:2 Splitter
Switch to ConnectX-6, BlueField-2, or Quantum Switch - HDR

MFA7U10-Hxxx	**NVIDIA AOC 1:2 splitter, InfiniBand 2x HDR to 2x HDR 400Gb/s to 2x 200Gb/s, OSFP to 2x QSFP56** **xxx indicates length in meters: 003, 005, 010, 015, 020, 030**

Backward-Compatible Direct Attach Copper Cable (DAC), 1:2 Splitter
Switch to ConnectX-6, BlueField-2, or Quantum Switch - HDR

MCP7Y60-Hxxx	**NVIDIA DAC 1:2 splitter, InfiniBand 2x HDR to 2x HDR 400Gb/s to 2x 200Gb/s, OSFP to 2x QSFP56** **xxx indicates length in meters: 001, 01A (1.5m), 002**

Backward-Compatible Direct Attach Copper Cable (DAC), 1:4 Splitter
Switch to ConnectX-6, BlueField-2, or Quantum Switch - HDR100

MCP7Y70-Hxxx	**NVIDIA DAC 1:4 splitter, InfiniBand 2x HDR to 4x HDR100, 400Gb/s to 4x 100Gb/s, OSFP to 4x QSFP56** **xxx indicates length in meters: 001, 01A (1.5m), 002**

Backward-Compatible Direct Attach Copper Cable (DAC), 1:2 Splitter
Switch to ConnectX-6, BlueField-2, or Quantum Switch - EDR

MCP7Y60-Hxxx	**NVIDIA DAC 1:2 splitter, InfiniBand 2x EDR to 2x EDR 200Gb/s to 2x 100Gb/s, OSFP to 2x QSFP28** **xxx indicates length in meters: 001, 01A (1.5m), 002**

Learn more

To learn more about NVIDIA Quantum-2 InfiniBand platform, visit:
nvidia.com/en-us/networking/quantum2/