ThinkSystem NVIDIA BlueField-3 QSFP112 Adapters
Product Guide

NVIDIA BlueField-3 is an advanced compute platform that enables software-defined, hardware-accelerated IT infrastructures. BlueField-3 offloads, accelerates, and isolates software-defined networking, storage, security, and management functions.

Two BlueField-3 adapters are offered in the ThinkSystem portfolio:

- Model B3220, a Data processing unit (DPU) adapter, with 16 Arm cores, 32GB of DDR5 memory, and two ports of 200Gb/s Ethernet or NDR200 InfiniBand network connectivity
- Model B3140H, a SuperNIC, with 8 Arm cores,16GB of DDR5 memory, and one port of 400Gb/s Ethernet or NDR InfiniBand network connectivity

The NVIDIA BlueField-3 DPU is a full-height half-length (FHHL) adapter as shown in the following figure.

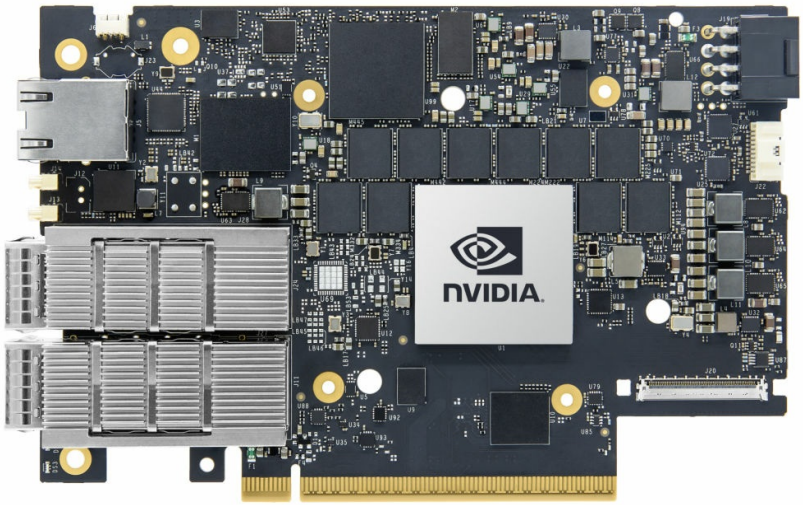

Figure 1. ThinkSystem NVIDIA BlueField-3 B3220 VPI QSFP112 2P 200G PCIe Gen5 x16 Adapter

Did you know?

Powered by NVIDIA DOCA™, BlueField-3 enables full data center programmability through open APIs and an optimized developer experience. Top ISV providers and server makers are using DOCA for accelerating innovation and achieving better business outcomes with BlueField DPUs. Paired with NVIDIA GPUs, BlueField-3 secures and accelerates cloud-native computing platforms.

Compared to the BlueField-2 adapter, the BlueField-3 provides 4X more compute power, up to 4X faster crypto acceleration, 2X faster storage processing, and 4X more memory bandwidth, all while delivering full backward compatibility through the NVIDIA DOCA™ software framework.

Part number information

The following table shows the part number for the adapter and auxiliary power cable. The power cable is required to provide the power needed by the adapter.

Table 1. Part number information

Part number	Feature code	Description	Purpose	Vendor part number
BlueField-3 SuperNIC				
4XC7A93809	C0Q4	ThinkSystem NVIDIA BlueField-3 B3140H VPI QSFP112 1P 400G PCIe Gen5 x16 Adapter	SuperNIC (model B3140H)	900-9D3D4-00EN-HA0
BlueField-3 DPU				
4XC7A87752	BVBG	ThinkSystem NVIDIA BlueField-3 B3220 VPI QSFP112 2P 200G PCIe Gen5 x16 Adapter	DPU (model B3220)	900-9D3B6-00CV-AA0
Auxiliary power cables for BlueField-3 DPU (model B3220) only				
4X97A91527	BXB6	ThinkSystem SR675 V3 BlueField-3 Power Cable Kit	For SR675 V3	Not applicable
CTO only	C1F7	ThinkSystem Rear BlueField-3 Power Cable	For SR680a V3 and SR685a V3	Not applicable

The part number includes the following:

- One adapter with a full-height (3U) adapter bracket
- Documentation

The NVIDIA BlueField-3 SuperNIC is a half-height half-length (HHHL) adapter as shown in the following figure.

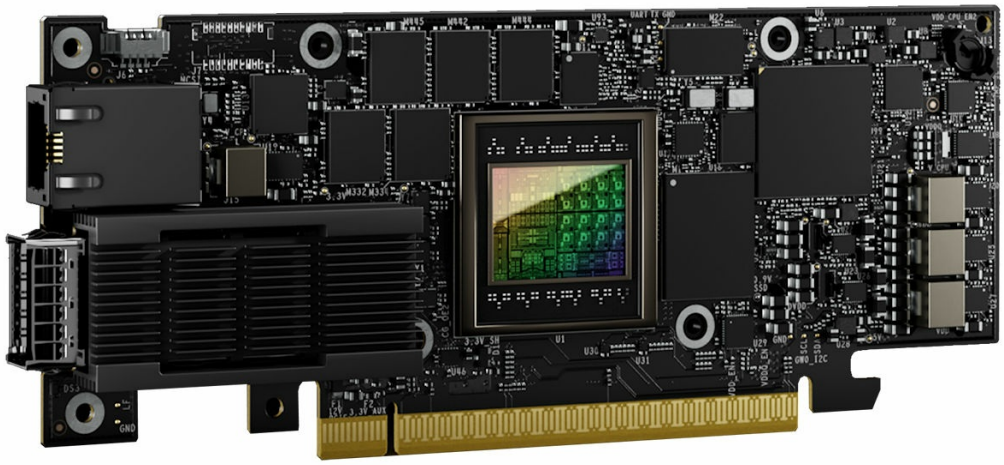

Figure 2. ThinkSystem NVIDIA BlueField-3 B3140H VPI QSFP112 1P 400G PCIe Gen5 x16 Adapter

Supported transceivers and cables

The following table lists the supported transceivers.

Table 2. Transceivers

Part number	Feature code	Description
200Gb Transceivers		
4TC7A81831	BQJZ	ThinkSystem NDR/NDR200 QSFP112 IB Multi Mode Solo-Transceiver

The following table lists the supported fiber optic cables and Active Optical Cables.

Table 3. Optical cables

Part number	Feature code	Description
QSFP56 HDR IB Optical Cables		
4Z57A14188	B4QW	3m Mellanox HDR IB Active Optical QSFP56 Cable
4Z57A14189	B4QX	5m Mellanox HDR IB Active Optical QSFP56 Cable
4Z57A14190	B4QY	10m Mellanox HDR IB Active Optical QSFP56 Cable
4Z57A14191	B4QZ	15m Mellanox HDR IB Active Optical QSFP56 Cable
4Z57A14192	B4R0	20m Mellanox HDR IB Active Optical QSFP56 Cable
Mellanox NDR Multi Mode Fibre Optical Splitter Cables		
4X97A81836	BQK4	Lenovo 3m NVIDIA NDR to 2x NDR200 Multi Mode Optical Cable
4X97A81837	BQK5	Lenovo 5m NVIDIA NDR to 2x NDR200 Multi Mode Optical Cable
4X97A81838	BQK6	Lenovo 7m NVIDIA NDR to 2x NDR200 Multi Mode MPO12 APC Optical Cable
4X97A81839	BQK7	Lenovo 10m NVIDIA NDR to 2x NDR200 Multi Mode Optical Cable
4X97A81840	BQK8	Lenovo 20m NVIDIA NDR to 2x NDR200 Multi Mode Optical Cable

The following table lists the supported direct-attach copper (DAC) cables.

Table 4. Copper cables

Part number	Feature code	Description
QSFP56 HDR InfiniBand Passive DAC Cables		
4Z57A14182	B4QQ	0.5m Mellanox HDR IB Passive Copper QSFP56 Cable
4Z57A14183	B4QR	1m Mellanox HDR IB Passive Copper QSFP56 Cable
4Z57A14184	B4QS	1.5m Mellanox HDR IB Passive Copper QSFP56 Cable
4Z57A14185	B4QT	2m Mellanox HDR IB Passive Copper QSFP56 Cable
QSFP56 200Gb Ethernet Passive DAC Cables		
4X97A12613	BF92	Lenovo 3m Passive 200G QSFP56 Ethernet DAC Cable
Mellanox NDRx2 OSFP800 to 4x NDR200 QSFP112 Splitter Copper Cables		
4X97A81832	BQK0	Lenovo 1m NVIDIA NDRx2 OSFP800 to 4x NDR200 QSFP112 Passive Copper Splitter Cable
4X97A81833	BQK1	Lenovo 1.5m NVIDIA NDRx2 OSFP800 to 4x NDR200 QSFP112 Passive Copper Splitter Cable
4X97A81834	BQK2	Lenovo 2m NVIDIA NDRx2 OSFP800 to 4x NDR200 QSFP112 Passive Copper Splitter Cable
4X97A81835	BQK3	Lenovo 3m NVIDIA NDRx2 OSFP800 to 4x NDR200 QSFP112 Passive Copper Splitter Cable

Workloads

The BlueField-3 adapters are suitable for the following workload types:

- Cloud Networking: Cloud overlay, SDN acceleration, NAT, load balancer, NFV, video streaming
- Storage: NVMe over Fabrics (NVMe-oF), NVMe/ TCP™, elastic storage, hyper converged infrastructure (HCI)
- Security: Distributed next- generation firewall, IDS/ IPS, root of trust, micro- segmentation, DDOS prevention
- HPC / AI: Cloud-native supercomputing, multi-tenancy and security, communication accelerations
- Telco and Edge: Cloud RAN, virtualized edge gateways, VNF acceleration, edge microservers

Technical specifications

The BlueField-3 adapters have the following technical specifications:

Adapter specifications

- Ports:
  - B3220 adapter: 2 ports using 2x QSFP112 cages, each providing 200Gb/s Ethernet or NDR200 InfiniBand connectivity
  - B3140H adapter: 1 port with a QSFP112 cage, providing 400Gb/s Ethernet or NDR InfiniBand connectivity
- Based on a ConnectX-7 networking subsystem
- PCIe Gen5 x16 host interface
- Support for an Auxiliary Card which provides an additional x16 host connection for Sockets Direct (SharedIO) support ((B3220 adapter only)
- Maximum power consumption:
  - B3220 adapter: 150W
  - B3140H adapter: 75W

Compute and Memory

- Arm CPU cores
  - B3220 adapter: 16 Arm v8.2+ A78 Hercules cores (64-bit)
  - B3140H adapter: 8 Arm v8.2+ A78 Hercules cores (64-bit)
  - 8MB L2 cache
  - 16MB LLC system cache
- Programmable Datapath Accelerator
  - Programmability through DOCA
  - Heavy multi-threading applications acceleration
- DDR DIMM support
  - Dual DDR5 5600MT/s DRAM controllers
  - Onboard memory:
    - B3220 adapter: 32GB DDR5
    - B3140H adapter: 16GB DDR5
  - ECC error protection support

Networking protocol support

- InfiniBand: IBTA v1.5(a) (Auto-Negotiation):
  - (B3140H adapter only) NDR (4 lanes x 100Gb/s per lane)
  - NDR200 (2 lanes x 100Gb/s per lane)
  - HDR (50Gb/s per lane)
  - HDR100 (2 lane x 50Gb/s per lane)

    - EDR (25Gb/s per lane)
    - FDR (14.0625Gb/s per lane)
    - 1X/2X/4X SDR (2.5Gb/s per lane).
- Ethernet:
    - (B3140H adapter only) 400GAUI-4 C2M, 400GBASE-CR4
    - 200GAUI-2 C2M, 200GAUI-4 C2M, 200GBASE-CR4
    - 100GAUI-2 C2M, 100GAUI-1 C2M, 100GBASE-CR4, 100GBASE-CR2, 100GBASE-CR1
    - 50GAUI-2 C2M, 50GAUI-1 C2M, 50GBASE-CR, 50GBASE-R2
    - 40GBASE-CR4, 40GBASE-R2
    - 25GBASE-R
    - 10GBASE-R, 10GBASE-CX4
    - 1000BASE-CX, CAUI-4 C2M, 25GAUI C2M, XLAUI C2M , XLPPI, SFI

Hardware Accelerations

- Security
    - Platform security
    - Secure boot with hardware root-of-trust (RoT)
    - Secure firmware update
    - On-board flash encryption
    - Device attestation
    - Functional isolation layer
    - Regular expression (RegEx) matching processor
    - IPsec/TLS/MACSec 128/256-bit data-in-motion encryption
    - PSP security protocol (PSP)
    - AES-GCM 128/256bit key
    - AES-XTS 256/512bit data-at-rest encryption
    - Connection tracking for statefull firewall
    - Public key accelerator (PKA)
    - True random number generator (TRNG)
- Storage
    - BlueField SNAP - Elastic block storage - NVMe and VirtIO-blk
    - NVMe-oF and NVMe/TCP acceleration
    - Decompression engine
    - Erasure coding for RAID implementation
- Networking
    - RoCE, Zero Touch RoCE
    - ASAP² - Accelerated Switch and Packet Processing® for SDN and VNF acceleration
    - Single Root I/O Virtualization (SR-IOV)
    - VirtIO acceleration
    - Overlay network acceleration
    - VXLAN, Geneve, NVGRE
    - Programmable flexible parser: user-defined classification
    - Connection tracking (L4 firewall)
    - Flow mirroring, sampling and statistics
    - Header rewrite
    - Hierarchical QoS
    - Stateless TCP offloads
- HPC/AI Accelerations
    - HPC / AI All-to-All engine
    - NVIDIA GPUDirect
    - NVIDIA GPUDirect Storage (GDS)
    - HPC MPI Tag Matching

Additional features

- Advanced Timing and Synchronization
  - IEEE 1588v2 (any profile)
  - G.8273.2 Class C
  - PTP hardware clock (PHC)
  - Line rate hardware timestamp
  - SyncE
  - G.8262.1 (eEEC)
  - Configurable PPS In and PPS Out
  - Time triggered scheduling
  - Time-based SDN acceleration
- Boot Options
  - Secure boot (RSA authenticated)
  - Remote boot over Ethernet
  - Remote boot over iSCSI
  - PXE and UEFI
- Management
  - 1GbE out-of-band management port via the RJ45 port (can be disabled)
  - In-band management via the two network ports (can be disabled)
  - NC-SI, MCTP over SMBus, and MCTP over PCIe
  - IPMI management interface
  - PLDM for Monitor and Control DSP0248
  - PLDM for Firmware Update DSP026
  - I2C interface for device control and configuration
  - SPI interface to flash
  - eMMC memory controller
  - UART via the onboard 20-pin NCSI/UART connector
  - USB via an onboard 4-pin connector

Server support

The following tables list the ThinkSystem servers that are compatible.

Table 5. Server support (Part 1 of 4)

		AMD V3				2S Intel V3			4S 8S Intel V3			Multi Node			GPU Rich				
Part Number	**Description**	**SR635 V3 (7D9H / 7D9G)**	**SR655 V3 (7D9F / 7D9E)**	**SR645 V3 (7D9D / 7D9C)**	**SR665 V3 (7D9B / 7D9A)**	**ST650 V3 (7D7B / 7D7A)**	**SR630 V3 (7D72 / 7D73)**	**SR650 V3 (7D75 / 7D76)**	**SR850 V3 (7D97 / 7D96)**	**SR860 V3 (7D94 / 7D93)**	**SR950 V3 (7DC5 / 7DC4)**	**SD535 V3 (7DD8 / 7DD1)**	**SD530 V3 (7DDA / 7DD3)**	**SD550 V3 (7DD9 / 7DD2)**	**SR670 V2 (7Z22 / 7Z23)**	**SR675 V3 (7D9Q / 7D9R)**	**SR680a V3 (7DHE)**	**SR685a V3 (7DHC)**	**SR780a V3 (7DJ5)**
4XC7A93809	ThinkSystem NVIDIA BlueField-3 B3140H VPI QSFP112 1P 400G PCIe Gen5 x16 Adapter	N	N	N	N	N	N	N	N	N	N	N	N	N	N	Y	N	Y	N
4XC7A87752	ThinkSystem NVIDIA BlueField-3 B3220 VPI QSFP112 2P 200G PCIe Gen5 x16 Adapter	N	N	N	N	N	N	N	N	N	N	N	N	N	N	Y	Y	Y	Y

Table 6. Server support (Part 2 of 4)

Part Number	Description	1S V3			Edge					Super Computing					1S Intel V2			2S Intel V2		
		ST50 V3 (7DF4 / 7DF3)	ST250 V3 (7DCF / 7DCE)	SR250 V3 (7DCM / 7DCL)	SE350 (7Z46 / 7D1X)	SE350 V2 (7DA9)	SE360 V2 (7DAM)	SE450 (7D8T)	SE455 V3 (7DBY)	SD665 V3 (7D9P)	SD665-N V3 (7DAZ)	SD650 V3 (7D7M)	SD650-I V3 (7D7L)	SD650-N V3 (7D7N)	ST50 V2 (7D8K / 7D8J)	ST250 V2 (7D8G / 7D8F)	SR250 V2 (7D7R / 7D7Q)	ST650 V2 (7Z75 / 7Z74)	SR630 V2 (7Z70 / 7Z71)	SR650 V2 (7Z72 / 7Z73)
4XC7A93809	ThinkSystem NVIDIA BlueField-3 B3140H VPI QSFP112 1P 400G PCIe Gen5 x16 Adapter	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N
4XC7A87752	ThinkSystem NVIDIA BlueField-3 B3220 VPI QSFP112 2P 200G PCIe Gen5 x16 Adapter	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N

Table 7. Server support (Part 3 of 4)

Part Number	Description	AMD V1					Dense V2				4S V2		8S	4S V1			1S Intel V1			
		SR635 (7Y98 / 7Y99)	SR655 (7Y00 / 7Z01)	SR655 Client OS	SR645 (7D2Y / 7D2X)	SR665 (7D2W / 7D2V)	SD630 V2 (7D1K)	SD650 V2 (7D1M)	SD650-N V2 (7D1N)	SN550 V2 (7Z69)	SR850 V2 (7D31 / 7D32)	SR860 V2 (7Z59 / 7Z60)	SR950 (7X11 / 7X12)	SR850 (7X18 / 7X19)	SR850P (7D2F / 2D2G)	SR860 (7X69 / 7X70)	ST50 (7Y48 / 7Y50)	ST250 (7Y45 / 7Y46)	SR150 (7Y54)	SR250 (7Y52 / 7Y51)
4XC7A93809	ThinkSystem NVIDIA BlueField-3 B3140H VPI QSFP112 1P 400G PCIe Gen5 x16 Adapter	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N
4XC7A87752	ThinkSystem NVIDIA BlueField-3 B3220 VPI QSFP112 2P 200G PCIe Gen5 x16 Adapter	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N

Table 8. Server support (Part 4 of 4)

Part Number	Description	2S Intel V1								Dense V1			
		ST550 (7X09 / 7X10)	SR530 (7X07 / 7X08)	SR550 (7X03 / 7X04)	SR570 (7Y02 / 7Y03)	SR590 (7X98 / 7X99)	SR630 (7X01 / 7X02)	SR650 (7X05 / 7X06)	SR670 (7Y36 / 7Y37)	SD530 (7X21)	SD650 (7X58)	SN550 (7X16)	SN850 (7X15)
4XC7A93809	ThinkSystem NVIDIA BlueField-3 B3140H VPI QSFP112 1P 400G PCIe Gen5 x16 Adapter	N	N	N	N	N	N	N	N	N	N	N	N
4XC7A87752	ThinkSystem NVIDIA BlueField-3 B3220 VPI QSFP112 2P 200G PCIe Gen5 x16 Adapter	N	N	N	N	N	N	N	N	N	N	N	N

Operating system support

The adapter supports the operating systems listed in the following table.

Tip: This table is automatically generated based on data from Lenovo ServerProven.

Table 9. Operating system support for ThinkSystem NVIDIA BlueField-3 B3220 VPI QSFP112 2P 200G PCIe Gen5 x16 Adapter, 4XC7A87752

Operating systems	SR675 V3	SR680a V3
Red Hat Enterprise Linux 8.6	Y	N
Red Hat Enterprise Linux 8.7	Y	N
Red Hat Enterprise Linux 9.0	Y	N
Red Hat Enterprise Linux 9.1	Y	N
SUSE Linux Enterprise Server 15 SP6	Y	N
Ubuntu 22.04 LTS	Y	Y
VMware vSphere Hypervisor (ESXi) 8.0 U3	Y	N

Regulatory approvals

The BlueField-3 adapters have the following hardware certifications:

- Safety: CB / cTUVus / CE
- EMC: CE / FCC / VCCI / ICES / RCM
- RoHS compliant

Physical specifications

The ThinkSystem NVIDIA BlueField-3 B3140H VPI QSFP112 1P 400G PCIe Gen5 x16 Adapter is a HHHL adapter and has the following physical specifications:

- Length: 168 mm (6.6 inches)
- Height: 69 mm (2.7 inches)

The ThinkSystem NVIDIA BlueField-3 B3220 VPI QSFP112 2P 200G PCIe Gen5 x16 Adapter is a FHHL adapter and has the following physical specifications:

- Length: 168 mm (6.6 inches)
- Height: 111 mm (4.4 inches)

Operating environment

The BlueField-3 adapters are supported in the following environment:

- Temperature:
  - Operating: 0°C to 55°C (32°F to 131°F)
  - Storage: -40°C to 70°C (-40°F to 158°F)
- Humidity:
  - Operating: 10% to 85%
  - Storage: 10% to 90%

Warranty

One year limited warranty. When installed in a Lenovo server, this adapter assumes the server's base warranty and any warranty upgrades.

Related information

For more information, refer to these documents:

- ServerProven compatibility
  https://serverproven.lenovo.com/
- NVIDIA BlueField Data Processing Units product page
  https://www.nvidia.com/dpu
- NVIDIA DOCA
  https://developer.nvidia.com/networking/doca
- NVIDIA BlueField-3 User Guide:
  https://docs.nvidia.com/networking/display/BlueField3DPU
- NVIDIA BlueField-3 Software User Guide
  https://docs.nvidia.com/networking/display/BlueFieldDPUOSLatest

Related product families

Product families related to this document are the following:

- 25 Gb Ethernet Connectivity
- Ethernet Adapters
- InfiniBand & Omni-Path Adapters

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