



NVIDIA ConnectX-6 Dx Ethernet Adapter Cards for OCP Spec 3.0 User Manual

Table of contents

Introduction	10
Interfaces	20
Hardware Installation	29
Driver Installation	51
Linux Driver Installation	51
VMware Driver Installation	52
Windows Driver Installation	55
Updating Adapter Firmware	66
Troubleshooting	68
Specifications	72
Monitoring	90
Finding the MAC and Serial Number on the Adapter Card	91
Document Revision History	97

About This Manual

This is the User Guide for Ethernet NVIDIA® ConnectX®-6 Dx adapter cards for Open Compute Project Spec 3.0. These adapters' connectivity provides the highest performing low latency and most flexible interconnect solution for servers supporting OCP spec 3.0 adapter cards used in Enterprise Data Centers and High-Performance Computing environments.

Important Note:

In some of the OCP 3.0 prototype samples, the insertion force that is required to install the card into a particular PCI connector may exceed the maximum insertion force that is allowed by the connector's spec. NVIDIA is updating the OCP 3.0 cards to ensure the proper insertion process.

Ordering Part Numbers

The table below provides the ordering part numbers (OPN) for the available ConnectX-6 Dx Ethernet adapter cards for OCP Spec 3.0.

NVIDIA SKU	OPN	Marketing Description
900-9X658-0076-MB0	MCX623436MS-CDAB	ConnectX®-6 Dx EN adapter card, 100GbE , OCP3.0, With Host management, Dual-port QSFP56, Multi-Host or Socket Direct , PCIe 4.0 x16 , Secure Boot, No Crypto, Thumbscr

NVIDIA SKU	OPN	Marketing Description
		ew (Pull Tab) Bracket
900-9X675-0076-MB0	MCX623430MS-CDAB	ConnectX-6 Dx EN adapter card, 100GbE OCP3.0, With Host Management, Dual-port DSFP, Multi-Host or Socket Direct , PCIe 4.0 x16 , Secure Boot, No Crypto, Thumb screw (Pull Tab) Bracket
900-9X658-0086-SB0 ^(a)	MCX623436AC-CDAB	ConnectX® -6 Dx EN adapter card, 100GbE , OCP3.0, With Host Management, Dual-port QSFP56 , PCIe 4.0 x16 , Crypto and Secure

NVIDIA SKU	OPN	Marketing Description
		Boot, Thumb screw (Pull Tab) Bracket
900-9X658-0056-SB1	MCX623436AN-CDAB	ConnectX®-6 Dx EN adapter card, 100GbE , OCP3.0, With Host Management, Dual-port QSFP56 , PCIe 4.0 x16 , No Crypto, Thumb screw (Pull Tab) Bracket
900-9X658-0046-SIO	MCX623435AC-CDAI	ConnectX-6 Dx EN adapter card, 100GbE , OCP3.0, With Host Management, Single-port QSFP56 , PCIe 4.0 x16 , Crypto and Secure Boot, Internal

NVIDIA SKU	OPN	Marketing Description
		Lock Bracket
Note: (a) If your target application for this crypto-enabled card will utilize 100Gb/s or higher bandwidth, where a substantial part of the bandwidth will be allocated for IPsec traffic, please refer to the NVIDIA ConnectX-6 Dx Cards Product Release Notes document to learn about a potential bandwidth limitation. See Related Documents section for details on accessing the document.		

Legacy (EOL) Ordering Part Numbers

NVIDIA SKU	OPN	Marketing Description
900-9X624-0073-SB0	MCX623432AS-ADAB	ConnectX®-6 Dx EN adapter card, 25GbE , OCP3.0, With Host management, Dual -port SFP28 , PCIe 4.0 x16 , Secure Boot, No Crypto, Thumbscrew (Pull Tab) Bracket
900-9X624-0063-SB0	MCX623432AE-ADAB	ConnectX®-6 Dx EN adapter card, 25GbE , OCP3.0, With Host Management, Dual -port SFP28 , PCIe 4.0 x16 , Crypto , No Secure Boot, Thumbscrew (Pull Tab) Bracket
900-9X624-0085-SB0	MCX623432AC-GDAB	ConnectX®-6 Dx EN adapter card, 50GbE , OCP3.0, With Host Management, Dual -port SFP56 , PCIe 4.0 x16 , Crypto and Secure Boot , Thumbscrew (Pull Tab) Bracket
900-9X624-0075-SIO	MCX623432AS-GDAI	ConnectX®-6 Dx EN adapter card, 50GbE , OCP3.0, With Host Management, Dual -port SFP56 , PCIe 4.0 x16 , Secure Boot, No Crypto, Internal Lock Bracket
900-9X658-0016-SB0	MCX623435AN-CDAB	ConnectX®-6 Dx EN adapter card, 100GbE , OCP3.0, With Host management, Single -port QSFP56 , PCIe 4.0 x16 , No Crypto, Thumbscrew (Pull Tab) Bracket

NVIDIA SKU	OPN	Marketing Description
900-9X658-0046-SB0 ^(a)	MCX623435AC-CDAB	ConnectX-6 Dx EN adapter card, 100GbE , OCP3.0, With Host Management, Single -port QSFP56 , PCIe 4.0 x16 , Crypto and Secure Boot , Thumbscrew (Pull Tab) Bracket
900-9X658-0056-MB0	MCX623436MN-CDAB	ConnectX [®] -6 Dx EN adapter card, 100GbE , OCP3.0, With Host management, Dual -port QSFP56 , Multi-Host or Socket Direct , PCIe 4.0 x16 , No Crypto, Thumbscrew (Pull Tab) Bracket
900-9X658-0026-SB0	MCX623435AE-CDAB	ConnectX [®] -6 Dx EN adapter card, 100GbE , OCP3.0, With Host Management, Single -port QSFP56 , PCIe 4.0 x16 , Crypto , No Secure Boot, Thumbscrew (Pull Tab) Bracket
900-9X658-0038-SI0	MCX623435AS-VDAL	ConnectX [®] -6 Dx EN adapter card, 200GbE , OCP3.0, With Host Management, Single -port QSFP56 , PCIe 4.0 x16 , Secure Boot, No Crypto, Internal Lock Bracket
900-9X658-0066-SB0	MCX623436AE-CDAB	ConnectX-6 Dx EN adapter card, 100GbE, OCP3.0, With Host Management, Dual-port QSFP56, PCIe 4.0 x16, Crypto, No Secure Boot, Thumbscrew (Pull Tab) Bracket
900-9X658-0076-SI0	MCX623436AS-CDAL	ConnectX [®] -6 Dx EN adapter card, 100GbE OCP3.0, With Host Management, Dual -port QSFP56 , PCIe 4.0 x16 , Secure Boot, No Crypto, Internal Lock Bracket
900-9X675-0046-MB0	MCX623439MC-CDAB	ConnectX [®] -6 Dx EN adapter card, 100GbE , OCP3.0, With Host Management, Single -port QSFP56 , Multi-Host or Socket Direct , PCIe 4.0 x16 , Crypto and Secure Boot , Thumbscrew (Pull Tab) Bracket
900-9X624-0083-SB0	MCX623432AC-ADAB	ConnectX [®] -6 Dx EN adapter card, 25GbE , OCP3.0, With Host

NVIDIA SKU	OPN	Marketing Description
		Management, Dual-port SFP28 , PCIe 4.0 x16 , Crypto and Secure Boot , Thumbscrew (Pull Tab) Bracket
900-9X624-0003-SB0	MCX623432AN-ADAB	ConnectX®-6 Dx EN adapter card, 25GbE , OCP3.0, With Host management, Dual-port SFP28 , PCIe 4.0 x16 , No Crypto, Thumbscrew (Pull Tab) Bracket
900-9X624-0055-SB0	MCX623432AN-GDAB	ConnectX®-6 Dx EN adapter card, 50GbE , OCP3.0, With Host Management, Dual-port SFP56 , PCIe 4.0 x16 , No Crypto, Thumbscrew (Pull Tab) Bracket
900-9X658-0048-SB0	MCX623435AC-VDAB	ConnectX®-6 Dx EN adapter card, 200GbE , OCP3.0, With Host Management, Single-port QSFP56 , PCIe 4.0 x16 , Crypto and Secure Boot , Thumbscrew (Pull Tab) Bracket
900-9X658-0016-MB0	MCX623435MN-CDAB	ConnectX®-6 Dx EN adapter card, 100GbE , OCP3.0, With Host Management, Single-port QSFP56 , Multi-Host or Socket Direct , PCIe 4.0 x16 , No Crypto, Thumbscrew (Pull Tab) Bracket
900-9X658-0018-SB0	MCX623435AN-VDAB	ConnectX®-6 Dx EN adapter card, 200GbE , OCP3.0, With Host Management, Single-port QSFP56 , PCIe 4.0 x16 , No Crypto, Thumbscrew (Pull Tab) Bracket

Intended Audience

This manual is intended for the installer and user of these cards. The manual assumes basic familiarity with the Ethernet network and architecture specifications.

Technical Support

Customers who purchased NVIDIA products directly from NVIDIA are invited to contact us through the following methods:

- URL: <https://www.nvidia.com> > Support
- E-mail: enterprisesupport@nvidia.com

Customers who purchased NVIDIA Global Support Services, please see your contract for details regarding Technical Support.

Customers who purchased NVIDIA products through an NVIDIA-approved reseller should first seek assistance through their reseller.

Related Documentation

NVIDIA OFED for Linux User Manual and Release Notes	User Manual describing OFED features, performance, band diagnostic, tools content, and configuration. See NVIDIA OFED for Linux Documentation .
WinOF-2 for Windows User Manual and Release Notes	User Manual describing WinOF-2 features, performance, Ethernet diagnostic, tools content, and configuration. See WinOF-2 for Windows Documentation .
NVIDIA VMware for Ethernet User Manual and Release Notes	User Manual describing the various components of the NVIDIA ConnectX® NATIVE ESXi stack. See http://www.nvidia.com Products > Software > Ethernet Drivers > VMware Driver
NVIDIA Firmware Utility (mlxup) User Manual and Release Notes	NVIDIA firmware update and query utility used to update the firmware. See http://www.nvidia.com > Products > Software > Firmware Tools > mlxup Firmware Utility
NVIDIA Firmware Tools (MFT) User Manual	User Manual describing the set of MFT firmware management tools for a single node. See MFT User Manual .
IEEE Std 802.3 Specification	IEEE Ethernet specification at http://standards.ieee.org/
PCI Express Specifications	Industry Standard PCI Express Base and Card Electromechanical Specifications at https://pcisig.com/specifications
Open Compute Project 3.0 Specification	https://www.opencompute.org/
NVIDIA LinkX Interconnect Solutions	NVIDIA LinkX cables and transceivers are designed to maximize the performance of High-

	Performance Computing networks, requiring high-bandwidth, low-latency connections between compute nodes and switch nodes. NVIDIA offers one of the industry's broadest portfolios of 40Gb/s, 56Gb/s, 100Gb/s, and 200Gb/s cables, including Direct Attach Copper cables (DACs), copper splitter cables, Active Optical Cables (AOCs), and transceivers in a wide range of lengths from 0.5m to 10km. NVIDIA tests every product in an end-to-end environment ensuring a Bit Error Rate of less than 1E-15 . Read more at https://www.nvidia.com/products/interconnect/ethernet-overview.php
NVIDIA ConnectX-6 Dx Cards Product Release Notes	Describes the hardware release notes for the ConnectX-6 Dx adapters. To access the document, log into NVOnline or contact your NVIDIA representative.

Document Conventions

When discussing memory sizes, MB and MBytes are used in this document to mean size in MegaBytes. The use of Mb or Mbits (small b) indicates the size in Megabits. In this document, PCIe is used to mean PCI Express.

Introduction

This is the *User Guide* for Ethernet adapter cards based on the ConnectX®-6 Dx integrated circuit device for OCP Spec 3.0. These adapters connectivity provide the highest performing low latency and most flexible interconnect solution for servers supporting OCP 3.0 used in Enterprise Data Centers and High-Performance Computing environments.

Important Note:

In some of the OCP 3.0 prototype samples, the insertion force that is required to install the card into a particular PCI connector may exceed the maximum insertion force that is allowed by the connector's spec. NVIDIA is updating the OCP 3.0 cards to ensure the proper insertion process.

The following table provides the ordering part number, port speed, number of ports, and PCI Express speed.

Note

Please note the following OPNs are shipped with an assembled thumbscrew (pull tab) bracket. For other retention mechanism brackets, please contact NVIDIA.

Products Overview

ConnectX-6 Dx 25GbE Adapter Cards for OCP 3.0

OPN	MCX623432AN-ADAB	MCX62343 2AC-ADAB	MCX6234 32AE- ADAB	MCX62343 2AS-ADAB
Network Connector Type	Dual-port SFP28	Dual-port SFP28	Dual-port SFP28	Dual-port SFP28

OPN	MCX623432AN-ADAB	MCX623432AC-ADAB	MCX623432AE-ADAB	MCX623432AS-ADAB
Ethernet Data Rate	10/25 Gb/s			
PCI Express Connectors	PCIe Gen 3.0 / 4.0 x16 SERDES @ 8.0GT/s / 16.0GT/s			
Dimensions	Small Form Factor (SFF) OCP 3.0 4.52 in. x 2.99 in (115.00mm x 76.00mm)			
Retention Mechanism	Thumbscrew (Pull Tab) Bracket			
RoHS	RoHS Compliant	RoHS Compliant	RoHS Compliant	RoHS Compliant
IC Part Number	MT28928A0-XCCF-CE	MT28928A0-XCCF-CE	MT28928A0-XCCF-CE	MT28928A0-XCCF-CE
Host Management	✓	✓	✓	✓
Crypto	-	✓	✓	-
Secure Boot	✓	✓	-	✓
Device ID	4125 for Physical Function (PF) 4126 for Virtual Function (VF)			

ConnectX-6 Dx 50GbE Adapter Cards for OCP 3.0

OPN	MCX623432AN-GDAB	MCX623432AC-GDAB	MCX623432AS-GDAI
Network Connector Type	Dual-port SFP56	Dual-port SFP56	Dual-port SFP56
Ethernet Data Rate	10/25/50 Gb/s		
PCI Express Connectors	PCIe Gen 3.0 / 4.0 x16 SERDES @ 8.0GT/s / 16.0GT/s		
Dimensions	Small Form Factor (SFF) OCP 3.0 4.52 in. x 2.99 in (115.00mm x 76.00mm)		
Retention Mechanism	Thumbscrew (Pull Tab) Bracket	Thumbscrew (Pull Tab) Bracket	Internal Lock Bracket

OPN	MCX623432AN-GDAB	MCX623432AC-GDAB	MCX623432AS-GDAI
RoHS	RoHS Compliant	RoHS Compliant	RoHS Compliant
IC Part Number	MT28928A0-XCCF-CE	MT28928A0-XCCF-CE	MT28928A0-XCCF-CE
Host Management	✓	✓	✓
Crypto	-	✓	-
Secure Boot	-	✓	✓
Device ID	4125 for Physical Function (PF) 4126 for Virtual Function (VF)		

ConnectX-6 Dx 100GbE Adapter Cards for OCP 3.0

OPN	MCX 6234 36AN - CDA B	MCX 6234 36AC - CDA B	MCX 6234 35M N-CDA B	MCX 6234 36M N-CDA B	MCX 6234 36M S-CDA B	MCX 6234 36A S-CDAI	MCX 6234 35A C-CDAI	MCX 6234 35A C-CDA B	MCX 6234 35AE - CDA B	MCX 6234 35A N-CDA B	MCX 6234 39M C[/N] - CDA B	MCX 6234 30M S-CDA B
Network Connector Type	Dual-port QSFP 56	Dual-port QSFP 56	Single-port QSFP 56	Dual-port QSFP 56	Dual-port QSFP 56	Dual-port QSFP 56	Single-port QSFP 56	Single-port QSFP 56	Single-port QSFP 56	Single-port QSFP 56	Single-port QSFP 56	Dual-port QSFP 56
Ethernet Data Rate	10/25/40/50/100 Gb/s											
PCI Express	PCIe Gen 3.0 / 4.0 x16 SERDES @ 8.0GT/s / 16.0GT/s											

OPN	MCX 6234 36AN - CDA B	MCX 6234 36AC - CDA B	MCX 6234 35M N-CDA B	MCX 6234 36M N-CDA B	MCX 6234 36M S-CDA B	MCX 6234 36A S-CDAI	MCX 6234 35A C-CDAI	MCX 6234 35A C-CDA B	MCX 6234 35AE - CDA B	MCX 6234 35A N-CDA B	MCX 6234 39M C[/N] - CDA B	MCX 6234 30M S-CDA B
Connectors												
Dimensions	Small Form Factor (SFF) OCP 3.0 4.52 in. x 2.99 in (115.00mm x 76.00mm)											
Retention Mechanism	Thumbscrew (Pull Tab) Bracket	Thumbscrew (Pull Tab) Bracket	Thumbscrew (Pull Tab) Bracket	Thumbscrew (Pull Tab) Bracket	Thumbscrew (Pull Tab) Bracket	Internal Lock Bracket	Internal Lock Bracket	Thumbscrew (Pull Tab) Bracket	Thumbscrew (Pull Tab) Bracket	Thumbscrew (Pull Tab) Bracket	Thumbscrew (Pull Tab) Bracket	Thumbscrew (Pull Tab) Bracket
RoHS	RoHS Compliant	RoHS Compliant	RoHS Compliant	RoHS Compliant	RoHS Compliant	RoHS Compliant	RoHS Compliant	RoHS Compliant	RoHS Compliant	RoHS Compliant	RoHS Compliant	RoHS Compliant
IC Part Number	MT2 8928 AO-XCCF-CE	MT2 8928 AO-XCCF-CE	MT2 8928 AO-XCCF-CE	MT2 8928 AO-XCCF-CE	MT2 8928 AO-XCCF-CE	MT2 8928 AO-XCCF-CE	MT2 8928 AO-XCCF-CE	MT2 8928 AO-XCCF-CE	MT2 8928 AO-XCCF-CE	MT2 8928 AO-XCCF-CE	MT2 8928 AO-XCCF-CE	MT2 8928 AO-XCCF-CE
Host Management	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Crypto	-	✓	-	-	-	-	✓	✓	✓	-	✓	✓
Secure	-	✓	-	-	✓	✓	✓	✓	-	-	✓	✓

OPN	MCX 6234 36AN - CDA B	MCX 6234 36AC - CDA B	MCX 6234 35M N- CDA B	MCX 6234 36M N- CDA B	MCX 6234 36M S- CDA B	MCX 6234 36A S- CDAI	MCX 6234 35A C- CDAI	MCX 6234 35A C- CDA B	MCX 6234 35AE - CDA B	MCX 6234 35A N- CDA B	MCX 6234 39M C[/N] - CDA B	MCX 6234 30M S- CDA B
Boot												
Multi-Host or Socket Direct	-	-	✓	✓	✓	-	-	-	-	-	✓	-
Device ID	4125 for Physical Function (PF) 4126 for Virtual Function (VF)											

ConnectX-6 Dx 200GbE Adapter Cards for OCP 3.0

OPN	MCX623435AN-VDAB	MCX623435AC-VDAB	MCX623435AS-VDAI
Network Connector Type	Single-port QSFP56	Single-port QSFP56	Single-port QSFP56
Ethernet Data Rate	10/25/40/50/100/200 Gb/s		
PCI Express Connectors	PCIe Gen 3.0 / 4.0 x16 SERDES @ 8.0GT/s / 16.0GT/s		
Dimensions	Small Form Factor (SFF) OCP 3.0 4.52 in. x 2.99 in (115.00mm x 76.00mm)		
Retention Mechanism	Thumbscrew (Pull Tab) Bracket	Thumbscrew (Pull Tab) Bracket	Internal Lock Bracket
RoHS	RoHS Compliant	RoHS Compliant	RoHS Compliant
IC Part Number	MT28928A0-XCCF-CE	MT28928A0-XCCF-CE	MT28928A0-XCCF-CE

OPN	MCX623435AN-VDAB	MCX623435AC-VDAB	MCX623435AS- VDAI
Host Management	✓	✓	✓
Crypto	-	✓	-
Secure Boot	-	✓	✓
Device ID	4125 for Physical Function (PF) 4126 for Virtual Function (VF)		

For more detailed information see [Specifications](#).

Features and Benefits

Note

This section describes hardware features and capabilities. Please refer to the relevant driver and/or firmware release notes for feature availability.

Feature	Description
PCI Express (PCIe)	Uses PCIe Gen 3.0 (8GT/s) or Gen 4.0 (16GT/s) through x16 edge connector.
Up to 200 Gigabit Ethernet	NVIDIA adapters comply with the following IEEE 802.3 standards: • 200GbE / 100GbE / 50GbE / 40GbE / 25GbE / 10GbE / 1GbE • IEEE 802.3bj, 802.3bm 100 Gigabit Ethernet • IEEE 802.3by, Ethernet Consortium²⁵, 50 Gigabit Ethernet, supporting all FEC modes • IEEE 802.3ba 40 Gigabit Ethernet • IEEE 802.3by 25 Gigabit Ethernet • IEEE 802.3ae 10 Gigabit Ethernet • IEEE 802.3ap based auto-negotiation and KR startup

Feature	Description
	• Proprietary Ethernet protocols (20/40GBASE-R2, 50GBASE-R4) • IEEE 802.3ad, 802.1AX Link Aggregation • IEEE 802.1Q, 802.1P VLAN tags and priority • IEEE 802.1Qau (QCN) • Congestion Notification • IEEE 802.1Qaz (ETS) • IEEE 802.1Qbb (PFC) • IEEE 802.1Qbg • IEEE 1588v2 • Jumbo frame support (9.6KB)
Memory Components	• EEPROM - The EEPROM capacity is 32Kbit. FRU I²C address is (0x50) and is accessible through the PCIe SMBus (Note: Address 0x58 is reserved.) • SPI Quad - includes 256Mbit SPI Quad Flash device (MX25L25645GXDI-08G device by Macronix)
Overlay Networks	In order to better scale their networks, data center operators often create overlay networks that carry traffic from individual virtual machines over logical tunnels in encapsulated formats such as NVGRE and VXLAN. While this solves network scalability issues, it hides the TCP packet from the hardware offloading engines, placing higher loads on the host CPU. ConnectX®-6 Dx effectively addresses this by providing advanced NVGRE and VXLAN hardware offloading engines that encapsulate and de-capsulate the overlay protocol.
RDMA and RDMA over Converged Ethernet (RoCE)	ConnectX®-6 Dx, utilizing RDMA (Remote Data Memory Access) and RoCE (RDMA over Converged Ethernet) technology, delivers low-latency and high-performance over Band and Ethernet networks. Leveraging data center bridging (DCB) capabilities as well as ConnectX®-6 Dx advanced congestion control hardware

Feature	Description
	mechanisms, RoCE provides efficient low-latency RDMA services over Layer 2 and Layer 3 networks.
NVIDIA PeerDirect®	PeerDirect® communication provides high-efficiency RDMA access by eliminating unnecessary internal data copies between components on the PCIe bus (for example, from GPU to CPU), and therefore significantly reduces application run time. ConnectX®-6 Dx advanced acceleration technology enables higher cluster efficiency and scalability to tens of thousands of nodes.
CPU Offload	Adapter functionality enables reduced CPU overhead leaving more CPU resources available for computation tasks. Open vSwitch (OVS) offload using ASAP ² (TM) • Flexible match-action flow tables • Tunneling encapsulation/decapsulation
Quality of Service (QoS)	Support for port-based Quality of Service enabling various application requirements for latency and SLA.
Hardware-based I/O Virtualization	ConnectX®-6 Dx provides dedicated adapter resources and guaranteed isolation and protection for virtual machines within the server.
Storage Acceleration	A consolidated compute and storage network achieves significant cost-performance advantages over multi-fabric networks. Standard block and file access protocols can leverage RDMA for high-performance storage access. • NVMe over Fabric offloads for the target machine
SR-IOV	ConnectX®-6 Dx SR-IOV technology provides dedicated adapter resources and guaranteed isolation and protection for virtual machines (VM) within the server.

Feature	Description
NC-SI	The adapter supports a Network Controller Sideband Interface (NC-SI), MCTP over SMBus and MCTP over PCIe - Baseboard Management Controller interface.
High-Performance Accelerations	• Tag Matching and Rendezvous Offloads • Adaptive Routing on Reliable Transport • Burst Buffer Offloads for Background Checkpointing
Host Management	NVIDIA host management sideband implementations enable remote monitor and control capabilities using RBT, MCTP over SMBus, and MCTP over PCIe – Baseboard Management Controller (BMC) interface, supporting both NC-SI and PLDM management protocols using these interfaces. NVIDIA OCP 3.0 adapters support these protocols to offer numerous Host Management features such as PLDM for Firmware Update, network boot in UEFI driver, UEFI secure boot, and more.
Secure Boot	Hardware Root-of-Trust (RoT) Secure Boot and secure firmware update using RSA cryptography, and cloning-protection, via a device-unique secret key.
Crypto	Crypto – IPsec and TLS data-in-motion inline encryption and decryption offload and AES-XTS block-level data-at-rest encryption and decryption offload.
Wake-on-LAN (WoL)	The adapter supported Wake-on-LAN (WoL), a computer networking standard that allows an adapter to be turned on or awakened by a network message. In STBY mode, only port0 is available.
Reset-on-LAN (RoL)	Supported
NVIDIA Multi-Host	NVIDIA [®] Mellanox [®] Multi-Host technology enables next-generation Cloud, Web 2.0 and high-performance data centers to design and build new scale-out heterogeneous compute and storage racks

Feature	Description
	with direct connectivity between multiple hosts and the centralized network controller. This enables direct data access with the lowest latency to significantly improve densities and maximizes data transfer rates. For more information, please visit NVIDIA Multi-Host Solutions .

Operating Systems/Distributions

- RHEL/CentOS
- Windows
- FreeBSD
- VMware
- OpenFabrics Enterprise Distribution (OFED)
- OpenFabrics Windows Distribution (WinOF-2)

Connectivity

- Interoperable with 1/10/25/40/50/100/200 Gb/s Ethernet switches
- Passive copper cable with ESD protection
- Powered connectors for optical and active cable support

Interfaces

The below figures show the component side of the NVIDIA ConnectX-6 Dx adapter card. Each numbered interface referenced in the figure is described in the following table with a link to detailed information.

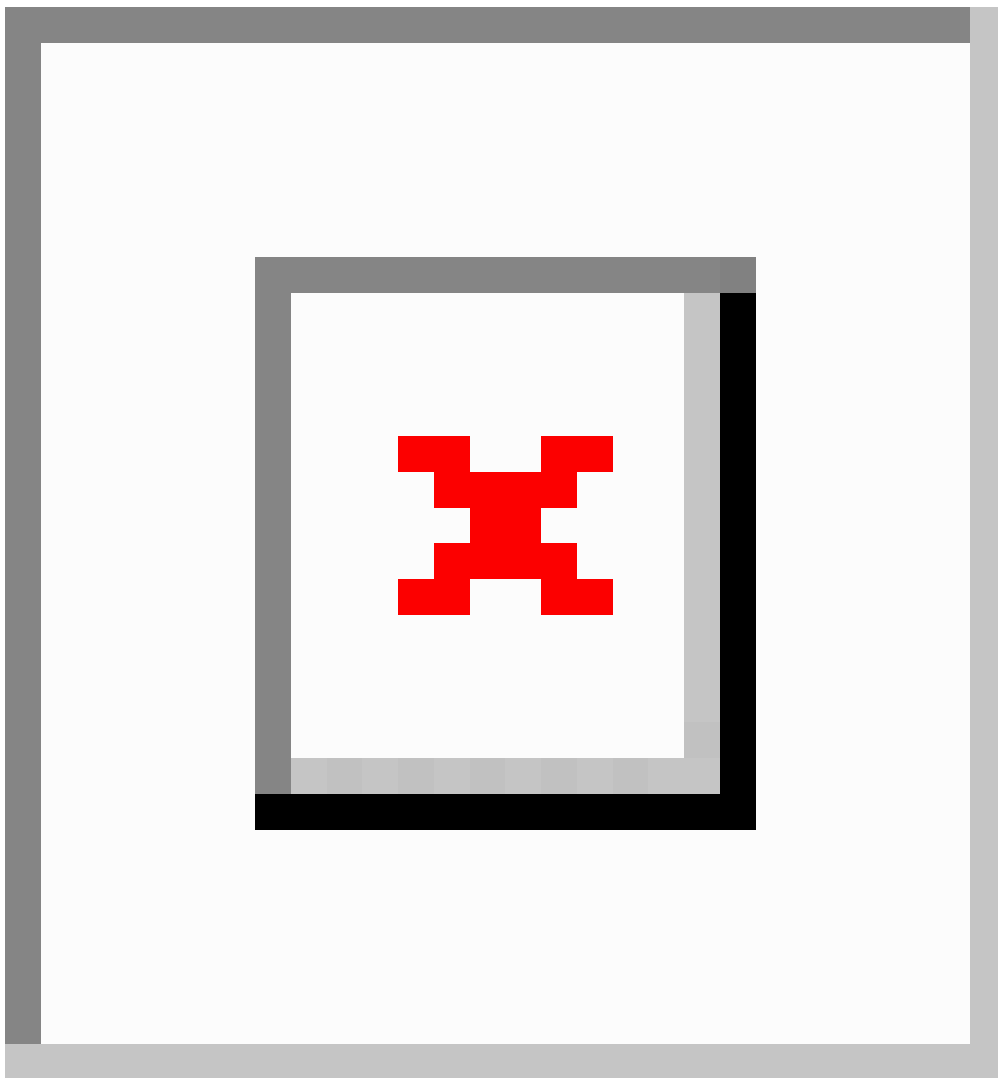
Note

The ConnectX-6 Dx adapter card includes special circuits to protect from ESD shocks to the card/server when plugging copper cables.

Note

The below figures are for illustration purposes only and might not reflect the current revision of the adapter card.

NVIDIA ConenctX-6 Dx for OCP 3.0 Adapter Card Interfaces - Component Side



Callout	Item	Description
1	ConnectX-6 Dx IC	NVIDIA ConnectX-6 Dx IC on the board.
2	PCI Express Interface	PCIe Gen 3.0/4.0 through an x16 edge connector.
3	Ethernet Networking Interface	Ethernet traffic is transmitted through

Callout	Item	Description
		the adapter's SFP28/SFP56/QSFP56 connectors. The networking connectors allow for the use of modules, optical and passive cable interconnect solutions.
4	Networking Ports LEDs Interface	There are two I/O LEDs, LED0 and LED1, per port to indicate speed and link status.
	FRU EEPROM	FRU EEPROM capacity 4Kb
	SMBus Interface	Allows BMC connectivity using MCTP over SMBus or MCTP over

Callout	Item	Description
		PCIe protocols.
	<u>Voltage Regulators</u>	Voltage supply pins that feed onboard regulators.
	<u>CPLD Interface</u>	Controls the networking port LEDs.

ConnectX-6 Dx IC

The ConnectX®-6 Dx EN family of adapter IC devices delivers two ports of 10/25/40/50/100Gb/s or a single port of 200Gb/s Ethernet connectivity paired with best-in-class hardware capabilities that accelerate and secure cloud and data-center workloads.

Encryption

Note

Applies to Crypto-enabled OPNs.

ConnectX-6 Dx brings security to every end-point, including:

- Purpose-built inline acceleration engines that offload IPsec and TLS data-in-motion and XTS-AES data-at-rest cryptographic operations.
- Stateful firewall solution acceleration, powered by Open vSwitch connection tracking and NVIDIA's ASAP2 technology.

- Embedded hardware root-of-trust and support for RSA-based secure firmware update and secure boot, guaranteeing the network adapter's integrity.

NVIDIA Multi-Host™ Support

In addition to building exceptionally high bandwidth to the data center, the ConnectX-6 Dx device enables leveraging this speed across the entire data center utilizing its NVIDIA Multi-Host feature.

Using its 32-lane PCI Express interface, a single ConnectX-6 Dx device can provide 200GbE interconnect for up to four independent hosts without any performance degradation.

The figure below shows a ConnectX-6 Dx device with NVIDIA Multi-Host connected to four separate hosts, each with a PCIe x4 interface, on one side to a switch on the other side.



The below bifurcation are optional for the adapter's x16 PCIe interface:

- x1 PCIe x16, x1 PCIe x8, x1 PCIe x4
- x2 PCIe x8, x2 PCIe x4, x2 PCIe x2, x2 PCIe x1
- x4 PCIe x4, x4 PCIe x2, x4 PCIe x1

Multi-host capable cards also support Socket-Direct applications and work as regular Single-Host cards, depending on the type of server they are plugged into, assuming the server complies with the OCP 3.0 spec.

According to the OCP 3.0 spec, the adapter card advertises its capability through the PRSNTB[3:0]# pins. The server determines the configuration through the BIF[2:0]# pins, which it drives to the adapter card.

The **NVIDIA OCP3.0 card** has an internal logic that uses the BIF[2:0]# data and determines the correct operating mode to boot at. The combination of the PRSNTB[3:0]# and BIF[2:0]# pins deterministically sets the PCIe lane width for a given combination of OCP 3.0 cards and baseboard. The logic and the decoding table can be found in the OCP 3.0 spec (Chapter **3.5 PCIe Bifurcation Mechanism**).

For example:

the **NVIDIA OCP 3.0 Multi-host adapter** drives **0100 on PRSNTB[3:0]# to the server.**

If Server Drivers	Adapter PCIe Mode
000	Single-Host Mode: x1 PCIe x16
001	Socket Direct Mode: x2 PCIe x8
010	Socket Direct Mode: x4 PCIe x4
101	Multi-Host Mode: x2 PCIe x8
110	Multi-Host Mode: x4 PCIe x4

Ethernet Networking Interfaces

The network ports of the ConnectX®-6 Dx adapter card are compliant with the IEEE 802.3 Ethernet standards listed in [Features and Benefits](#). Ethernet traffic is transmitted through the networking connectors on the adapter card.

Note

The adapter card includes special circuits to protect from ESD shocks to the card/server when plugging copper cables.

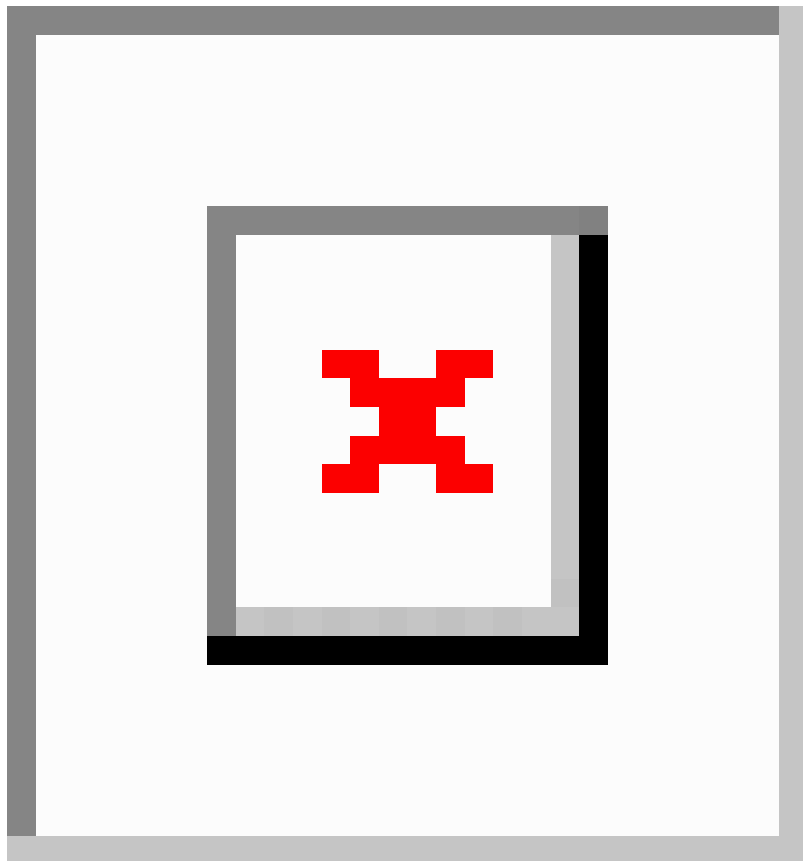
PCI Express Interface

The table below describes the supported PCIe interface in ConnectX®-6 Dx adapter cards.

Supported PCIe Interface	Features
PCIe Gen 3.0/4.0 (1.1 and 2.0 compatible) through x16 edge connectors	Link Rates: 2.5, 5.0, 8.0 or 16GT/s. Auto Negotiation to: x16, x8, x4, x2 or x1. Support for MSI/MSI-X mechanisms.

Networking Ports LEDs Interface

There are two I/O LEDs, LED0 and LED1, per port to indicate speed and link status. LED0 is a bicolor (yellow and green) LED, and LED1 is a single color (green) LED.



Link Indications

LED and State	Description									
1Hz blinking Yellow	Beacon command for locating the adapter card									
4Hz blinking Yellow	Indicates an error with the link. The error can be one of the following: <table><tr><th>Error Type</th><th>Description</th><th>LED Behavior</th></tr><tr><td>I²C</td><td>I²C access to the networking ports fails</td><td>Blinks until the error is fixed</td></tr><tr><td>Over-current</td><td>Over-current condition</td><td>Blinks until the error is fixed</td></tr></table>	Error Type	Description	LED Behavior	I ² C	I ² C access to the networking ports fails	Blinks until the error is fixed	Over-current	Over-current condition	Blinks until the error is fixed
Error Type	Description	LED Behavior								
I ² C	I ² C access to the networking ports fails	Blinks until the error is fixed								
Over-current	Over-current condition	Blinks until the error is fixed								

LED and State	Description		
	Error Type	Description	LED Behavior
		of the networking ports	
LED0 - Link Speed	• A constant Green indicates a link with the maximum networking speed. • A constant Yellow indicates a link with less than the maximum networking speed. • If LED0 is off, then the link has not been established.		
LED1 - Activity	• A blinking Green indicates a valid link with data transfer. • If LED1 is off, then there is no activity		

FRU EEPROM

FRU EEPROM allows the baseboard to identify different types of Mezzanine cards. FRU EEPROM is accessible through SMCLK and SMDATA. FRU EEPROM address is defined according to SLOT_ID0 and SLOT_ID1, and its capacity is 4Kb.

SMBus Interface

ConnectX®-6 Dx technology maintains support for manageability through a BMC. ConnectX®-6 Dx OCP 3.0 adapter can be connected to a BMC using MCTP over SMBus or MCTP over PCIe protocols as if it is a standard NVIDIA OCP 3.0 adapter. For configuring the adapter for the server's specific manageability solution, please contact NVIDIA Support.

Voltage Regulators

The voltage regulator power is derived from the OCP 3.0 edge connector 12V and 3.3V supply pins. These voltage supply pins feed onboard regulators that provide the necessary power to the various components on the card.

CPLD Interface

The adapter card incorporates a CPLD device that controls the networking port LEDs and the scan chain. It draws its power supply from 3.3V_EDGE.

Heatsink

A heatsink is attached to the ConnectX®-6 Dx IC to dissipate the heat. It is connected by four spring-loaded push pins that insert into four mounting holes.

ConnectX®-6 Dx IC has a thermal shutdown safety mechanism that automatically shuts down the ConnectX®-6 Dx card in case of a high-temperature event, improper thermal coupling, or heatsink removal.

Hardware Installation

Installation and initialization of ConnectX-6 Dx adapter cards for OCP Spec 3.0 require attention to electronic equipment's mechanical attributes, power specification, and precautions.

Safety Warnings



Info

Safety warnings are provided here in the English language. For safety warnings in other languages, refer to the [Adapter Installation Safety Instructions](#).

Note that not all warnings are relevant to all models.

	General Installation Instructions Read all installation instructions before connecting the equipment to the power source.
	Jewelry Removal Warning Before you install or remove equipment that is connected to power lines, remove jewelry such as bracelets, necklaces, rings, watches, and so on. Metal objects heat up when connected to power and ground and can meltdown, causing serious burns and/or welding the metal object to the terminals.
	Over-temperature This equipment should not be operated in an area with an ambient temperature exceeding the maximum recommended: 55°C (131°F). An airflow of 200LFM at this

	maximum ambient temperature is required for HCA cards and NICs. To guarantee proper airflow, allow at least 8cm (3 inches) of clearance around the ventilation openings.
	During Lightning - Electrical Hazard During periods of lightning activity, do not work on the equipment or connect or disconnect cables.
	Copper Cable Connecting/Disconnecting Some copper cables are heavy and not flexible, as such, they should be carefully attached to or detached from the connectors. Refer to the cable manufacturer for special warnings and instructions.
	Equipment Installation This equipment should be installed, replaced, or serviced only by trained and qualified personnel.
	Equipment Disposal The disposal of this equipment should be in accordance to all national laws and regulations.
	Local and National Electrical Codes This equipment should be installed in compliance with local and national electrical codes.

	Hazardous Radiation Exposure • Caution – Use of controls or adjustment or performance of procedures other than those specified herein may result in hazardous radiation exposure. For products with optical ports. • CLASS 1 LASER PRODUCT and reference to the most recent laser standards: IEC 60 825-1:1993 + A1:1997 + A2:2001 and EN 60825-1:1994+A1:1996+ A2:20
---	--

Installation Procedure Overview

The installation procedure of ConnectX-6 Dx adapter cards for OCP Spec 3.0 involves the following steps:

Step	Procedure	Direct Link
1	Check the system's hardware and software requirements.	Refer to System Requirements
2	Pay attention to the airflow consideration within the host system	Refer to Airflow Requirements
3	Follow the safety precautions	Refer to Safety Precautions
4	Follow the pre-installation checklist	Refer to Pre-Installation Checklist
5	(Optional) Replace the assembled OCP 3.0 bracket with the desired form factor bracket	Refer to OCP 3.0 Bracket

Step	Procedure	Direct Link
		Replacement Instructions
6	Install ConnectX-6 Dx adapter card for OCP spec 3.0 in the system	Refer to Installation Instructions
7	Connect cables or modules to the card	Refer to Cables and Modules
8	Identify the ConnectX-6 Dx adapter card in the system	Refer to Identify the Card in Your System

System Requirements

Warning

Unless otherwise specified, NVIDIA products are designed to work in an environmentally controlled data center with low gaseous and dust (particulate) contamination levels.

The operating environment should meet severity level G1 as per ISA 71.04 for gaseous contamination and ISO 14644-1 class 8 for cleanliness level.

Hardware Requirements

Warning

For proper operation and performance, please make sure to use a PCIe slot with a corresponding bus width that can supply sufficient power to your card. Refer to the Specifications section of the manual for more power requirements.

A system with a PCI Express x16 slot for OCP spec 3.0 is required for installing the card.

Airflow Requirements

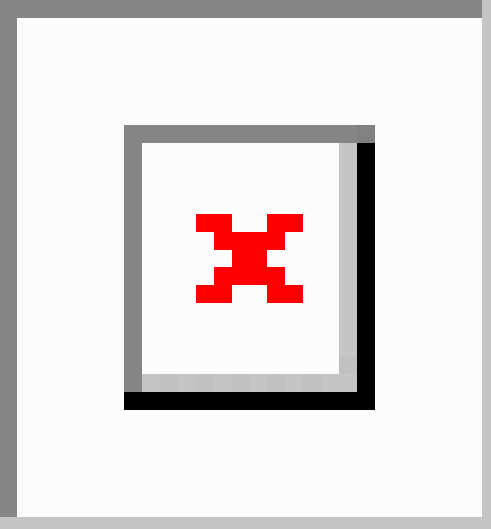
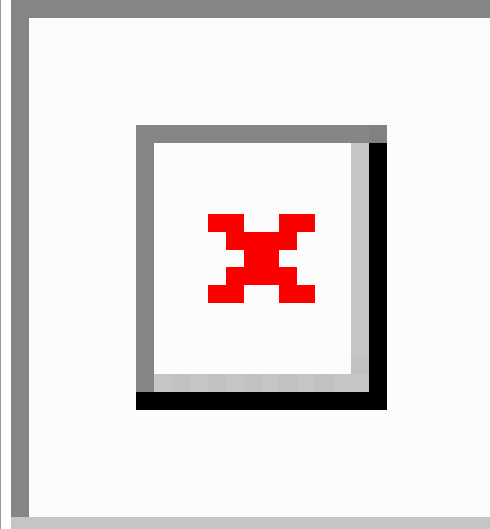
ConnectX-6 Dx adapter cards are offered with two airflow patterns: from the heatsink to the network ports and vice versa, as shown below.

Please refer to the "Specifications" chapter for airflow numbers for each specific card model.

Warning

All cards in the system should be planned with the same airflow direction.

Hot Aisle Cooling Heatsink-to-port Airflow Direction	Cold Aisle Cooling Port-to-heatsink Airflow Direction

Hot Aisle Cooling Heatsink-to-port Airflow Direction	Cold Aisle Cooling Port-to-heatsink Airflow Direction
	

Software Requirements

- See Operating Systems/Distributions section under the Introduction section.
- Software Stacks - NVIDIA OpenFabric software package MLNX_OFED for Linux, WinOF-2 for Windows, and VMware. See the Driver Installation section.

Safety Precautions



Warning

The adapter is being installed in a system that operates with voltages that can be lethal. Before opening the case of the system, observe the following precautions to avoid injury and prevent damage to system components.

1. Remove any metallic objects from your hands and wrists.
2. Make sure to use only insulated tools.

3. Verify that the system is powered off and is unplugged.
4. It is strongly recommended to use an ESD strap or other antistatic devices.

Pre-Installation Checklist

1. **Unpack the ConnectX-6 Dx adapter card.**

Unpack and remove the ConnectX-6 Dx card. Check the parts for visible damage that may have occurred during shipping. Please note that the cards must be placed on an antistatic surface.

Warning

If the card is removed hastily from the antistatic bag, the plastic ziplock may harm the EMI fingers on the networking connector. Carefully remove the card from the antistatic bag to avoid damaging the EMI fingers.

2. **Shut down your system if active:**

Turn off the power to the system, and disconnect the power cord. Refer to the system documentation for instructions. Before installing the ConnectX-6 Dx card, ensure the system is disconnected from power.

OCP 3.0 Bracket Replacement Instructions

The OCP 3.0 adapter card is shipped assembled either with a thumbscrew (pull-tab) bracket, an internal-lock bracket, or an ejector-latch bracket. If this form factor is suitable for your requirements, you can skip the remainder of this section and move to Installation Instructions. If you need to replace the assembled OCP 3.0 bracket with a different form-factor bracket, please follow the instructions in this section.

Warning

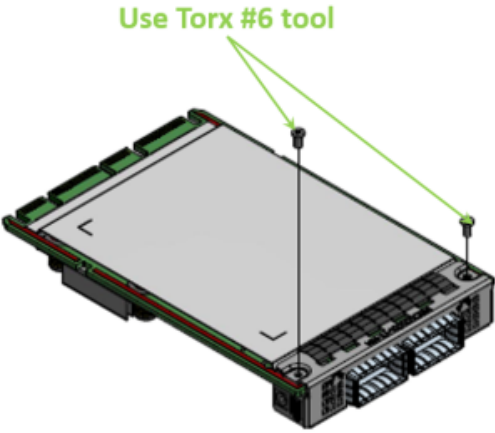
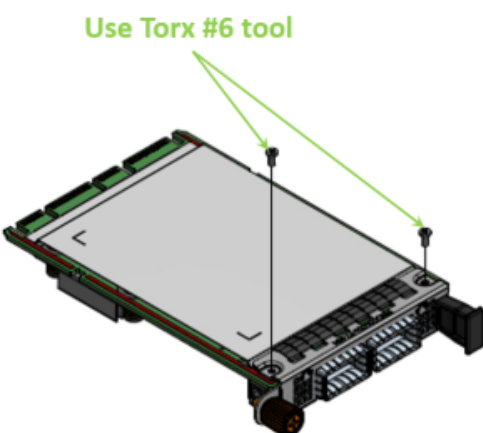
Due to risk of damaging the EMI gasket, it is not recommended to replace the bracket more than three times.

To replace the bracket you will need the following parts:

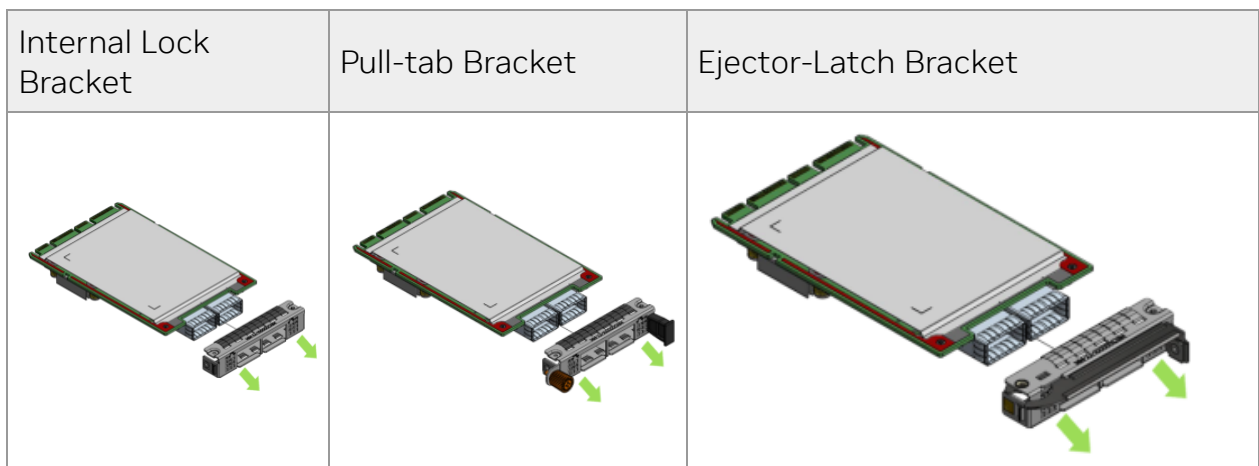
- The new bracket of the desired form factor.
- The screws supplied with the new bracket kit.
- The required torx tool type as specified in the instructions.

Removing the Existing Bracket

1. Using the torx tool type listed in the below table, remove the screws according to the instructions per OCP 3.0 bracket type.

Internal Lock Bracket	Pull-tab (Thumbscrew) Bracket	Ejector-Latch Bracket
 Use Torx #6 tool This diagram shows an internal lock bracket being removed from an OCP 3.0 card. Two green arrows point to screws on the top edge of the bracket, with the text 'Use Torx #6 tool' above them.	 Use Torx #6 tool This diagram shows a pull-tab (thumbscrew) bracket being removed from an OCP 3.0 card. Two green arrows point to thumbscrews on the top edge of the bracket, with the text 'Use Torx #6 tool' above them.	 Use Torx #6 tool This diagram shows an ejector-latch bracket being removed from an OCP 3.0 card. A single green arrow points to a screw on the top edge of the bracket, with the text 'Use Torx #6 tool' above it.

2. Gently separate the bracket from the OCP 3.0 card.



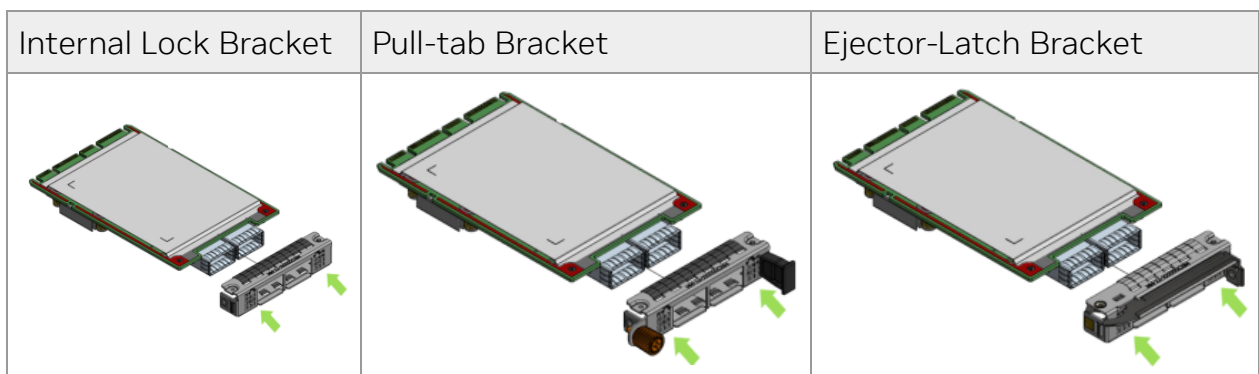
⚠ Warning

Be careful not to put stress on the LEDs on the adapter card.

3. Save the two screws.

Installing the New Bracket

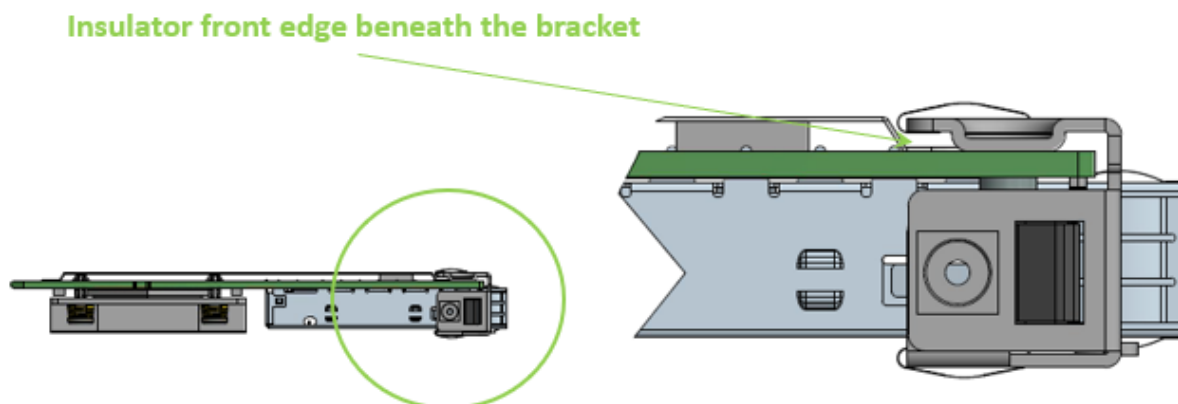
1. Assemble the new bracket onto the card.



⚠ Warning

Do not force the bracket onto the adapter card.

2. Ensure that the insulator's front edge is beneath the bracket, as shown in the below figure.



3. Screw on the OCP 3.0 bracket with the supplied screws that came with the new bracket kit. Use the specified torx tool type and apply the specified torque on the screws per bracket form factor.

Internal Lock Bracket	Pull-tab Bracket	Ejector-Latch Bracket
		Note that one screw is flat-head 90° screw and the other is socket-head screw. Screw on the different types of screws as shown in the below illustration. Use Torx #6 tool Closing torque = 0.14-0.18 Nm

OCP 3.0 Adapter Card Installation Instructions

This section provides detailed instructions on installing your adapter card in a system. The below table lists the different ConnectX-6 Dx OCP 3.0 retention mechanisms and offers direct links to installation instructions per bracket type.

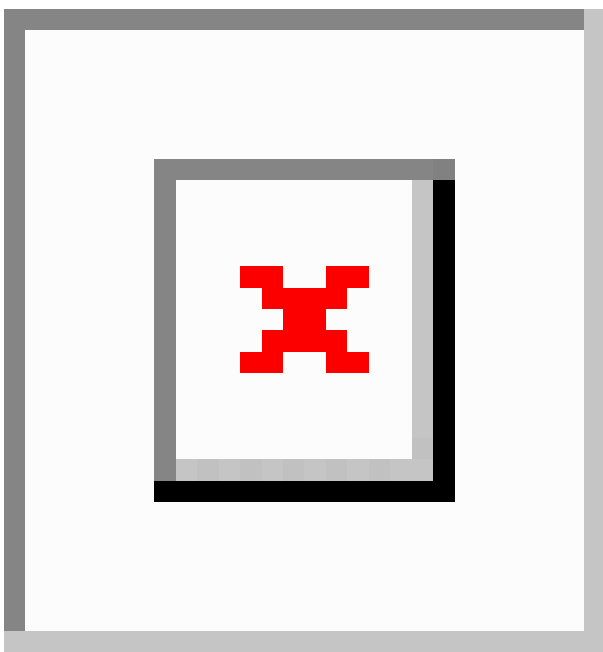
Retention Mechanism	Installation Instructions
Thumbscrew (Pull-tab) Bracket	Installation Instructions for Cards with Thumbscrew (Pull-tab) Bracket
Internal-Lock Bracket	Installation Instructions for Cards with Internal Lock
Ejector-Latch Bracket	Installation Instructions for Cards with Internal-Lock Bracket

Note

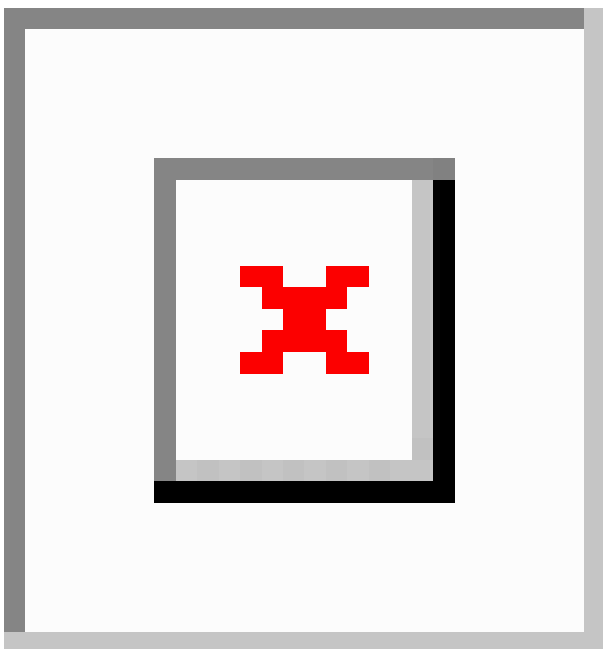
Please note that the following figures are for illustration purposes only.

Cards with Thumbscrew (Pull-tab) Bracket

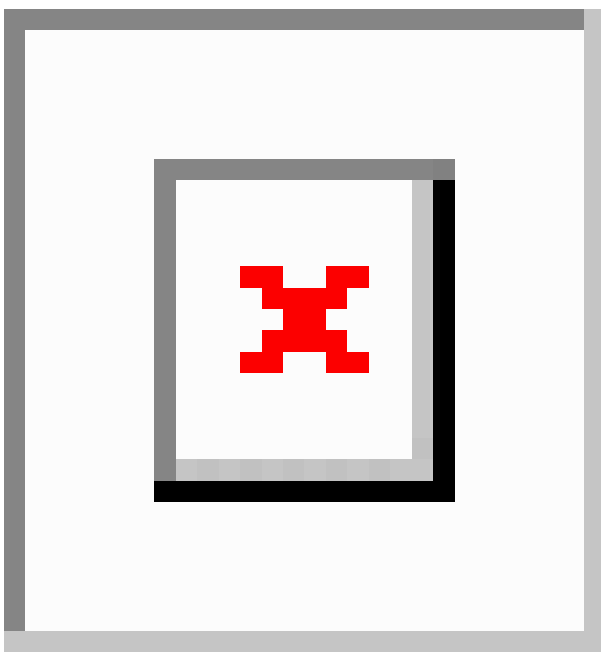
1. Before installing the card, ensure the system is off, and the power cord is not connected to the server. Please follow proper electrical grounding procedures.
2. Open the system case.
3. Align the card with the system rails.



4. Push the card until connectors are in full mate.

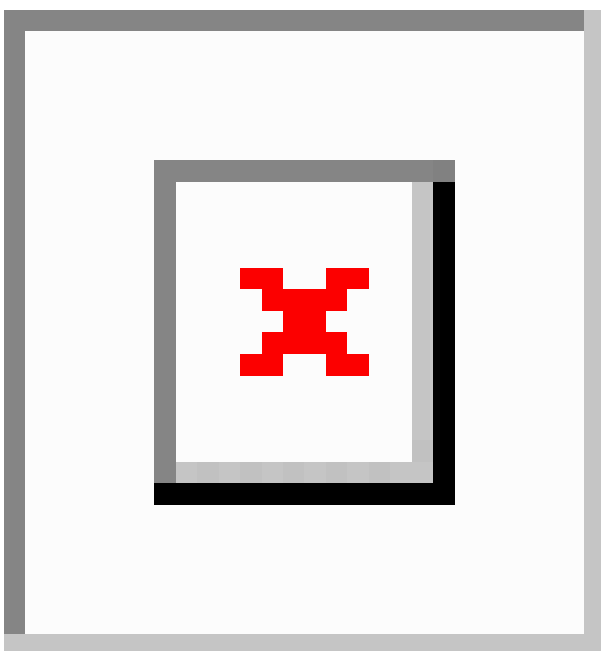


5. Turn the captive screw clockwise until firmly locked.

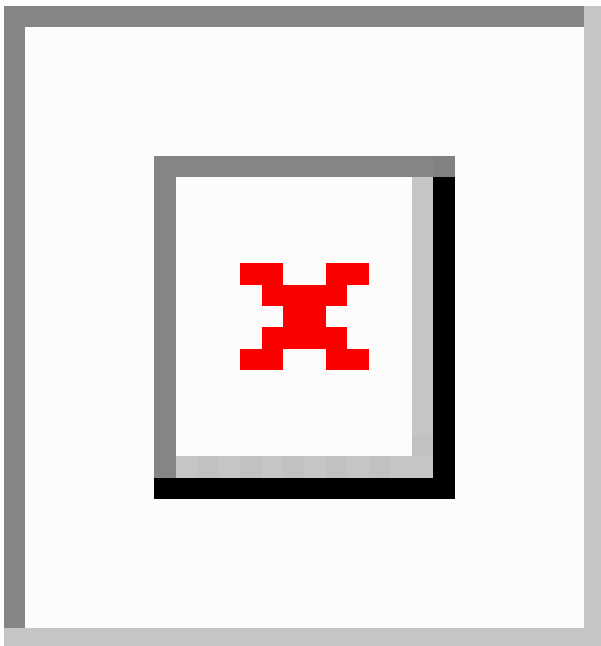


Cards with Internal Lock Bracket

1. Before installing the card, ensure the system is off, and the power cord is not connected to the server. Please follow proper electrical grounding procedures.
2. Open the system case.
3. Align the card with the system rails.

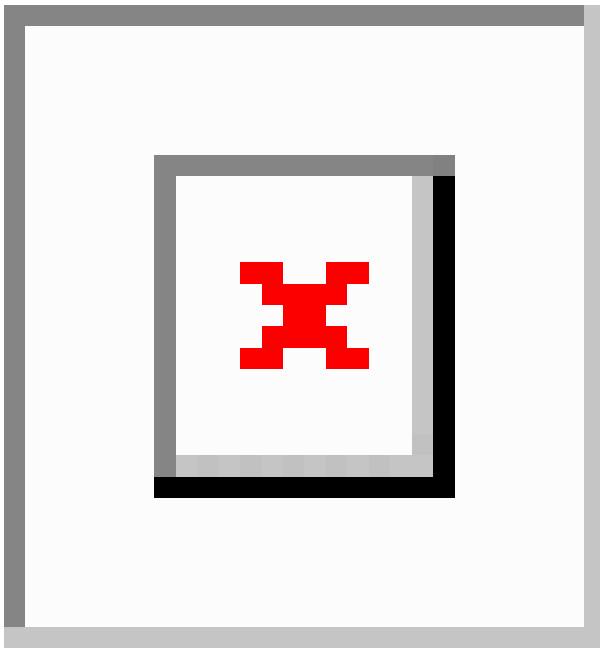


4. Push the card until connectors are in full mate and a clicking sound is heard.



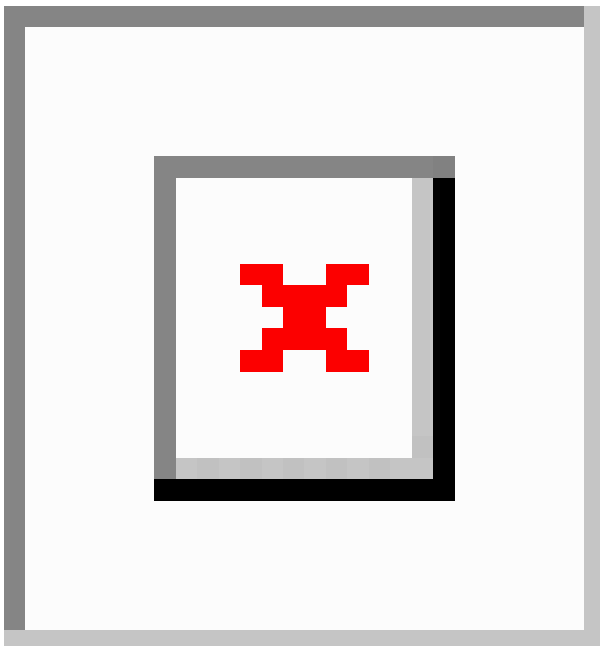
Cards with Ejector-Latch Bracket

1. Before installing the card, ensure the system is off, and the power cord is not connected to the server. Please follow proper electrical grounding procedures.
2. Open the system case.
3. Align the card with the system rails while ensuring the ejector latch is open.

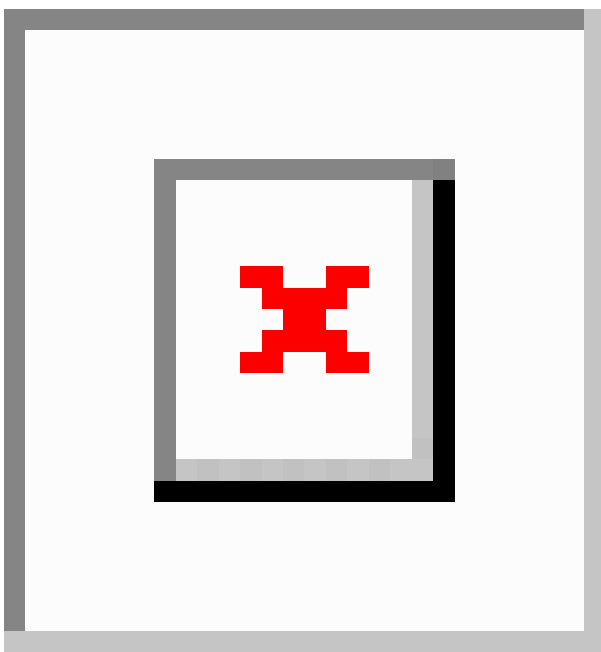


4. Push the card until connectors are in full mate.

Make sure the ejector latch is open before inserting the card.



5. To secure the card, close the ejector.



To uninstall the adapter card, see [Uninstalling the Card](#).

Cables and Modules

To obtain the list of supported NVIDIA cables for your adapter, please refer to the Cables Reference Table at <http://www.nvidia.com/products/interconnect/cables-configurator.php>.

Cable Installation

1. All cables can be inserted or removed with the unit powered on.
2. To insert a cable, press the connector into the port receptacle until the connector is firmly seated.
 1. Support the weight of the cable before connecting the cable to the adapter card. Do this by using a cable holder or tying the cable to the rack.
 2. Determine the correct orientation of the connector to the card before inserting the connector. Do not try and insert the connector upside down. This may damage the adapter card.
 3. Insert the connector into the adapter card. Be careful to insert the connector straight into the cage. Do not apply any torque, up or down, to the connector cage in the adapter card.

4. Make sure that the connector locks in place.

Note

When installing cables, make sure that the latches engage.

Warning

Always install and remove cables by pushing or pulling the cable and connector in a straight line with the card.

3. After inserting a cable into a port, the Yellow or Green LED0 indicator will light when the physical connection is established (that is, when the unit is powered on and a cable is plugged into the port with the other end of the connector plugged into a functioning port). See [Adapter Card LED Operations](#).
4. After plugging in a cable, lock the connector using the latching mechanism particular to the cable vendor. When a logical connection is made, Green LED1 will light. When data is being transferred, Green LED1 will blink.
5. Care should be taken so as not to impede the air exhaust flow through the ventilation holes. Use cable lengths that allow for routing horizontally around to the side of the chassis before bending upward or downward in the rack.
6. To remove a cable, disengage the locks and slowly pull the connector away from the port receptacle. The LED indicator will turn off when the cable is unseated.

Identifying the Card in Your System

On Linux

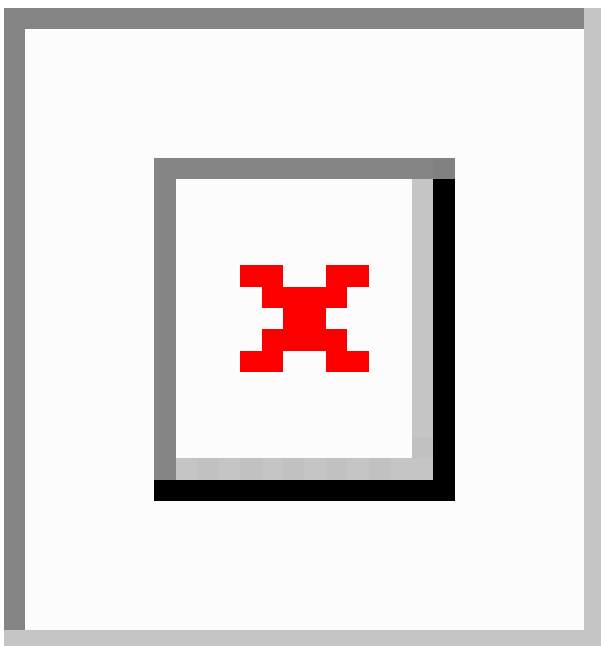
Get the device location on the PCI bus by running `lspci` and locating lines with the string "Mellanox Technologies":

```
lspci | grep -i Mellanox
Network controller: Mellanox Technologies MT28800 Family [ConnectX-6 Dx]
```

On Windows

1. Open Device Manager on the server. Click **Start** => **Run**, and then enter **devmgmt.msc**.
2. Expand **System Devices** and locate your NVIDIA ConnectX-6 Dx adapter card.
3. Right-click the mouse on your adapter's row and select **Properties** to display the adapter card properties window.
4. Click the **Details** tab and select **Hardware Ids** (Windows 2012/R2/2016) from the **Property** pull-down menu.

PCI Device (Example)



5. In the **Value** display box, check the fields VEN and DEV (fields are separated by '&'). In the display example above, notice the sub-string "PCI\VEN_15B3&DEV_1003": VEN is equal to 0x15B3 – this is the Vendor ID of NVIDIA; DEV is equal to 1018 (for ConnectX-6 Dx) – this is a valid NVIDIA PCI Device ID.

Note

If the PCI device does not have an NVIDIA adapter ID, return to Step 2 to check another device.

Note

The list of NVIDIA PCI Device IDs can be found in the PCI ID repository at <http://pci-ids.ucw.cz/read/PC/15b3>.

Card Extraction Instructions

Safety Precautions

The adapter is installed in a system that operates with voltages that can be lethal. Before uninstalling the adapter card, please observe the following precautions to avoid injury and prevent damage to system components.

1. Remove any metallic objects from your hands and wrists.
2. It is strongly recommended to use an ESD strap or other antistatic devices.
3. Turn off the system and disconnect the power cord from the server.

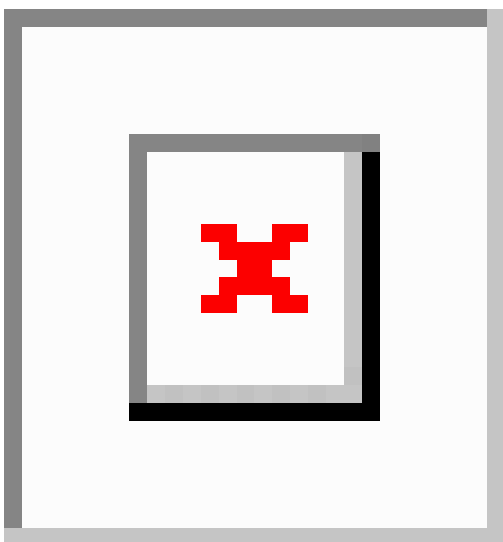
Cards Extraction Instructions

Info

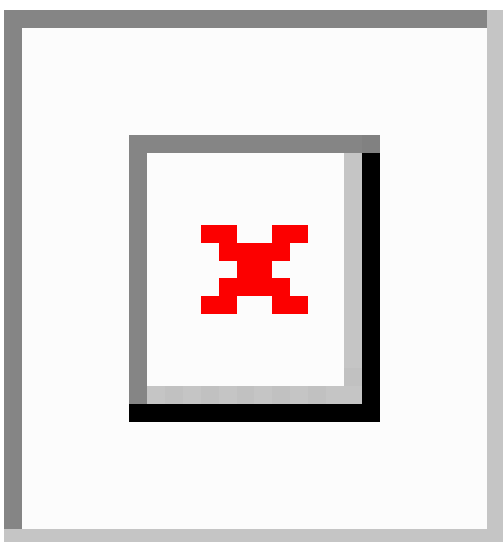
Please note that the following images are for illustration purposes only.

Cards with Thumbscrew (Pull-tab) Bracket

1. Verify that the system is powered off and unplugged.
2. Wait 30 seconds.
3. Rotate the captive screw counterclockwise.



4. While holding the tab, carefully pull out the adapter card.



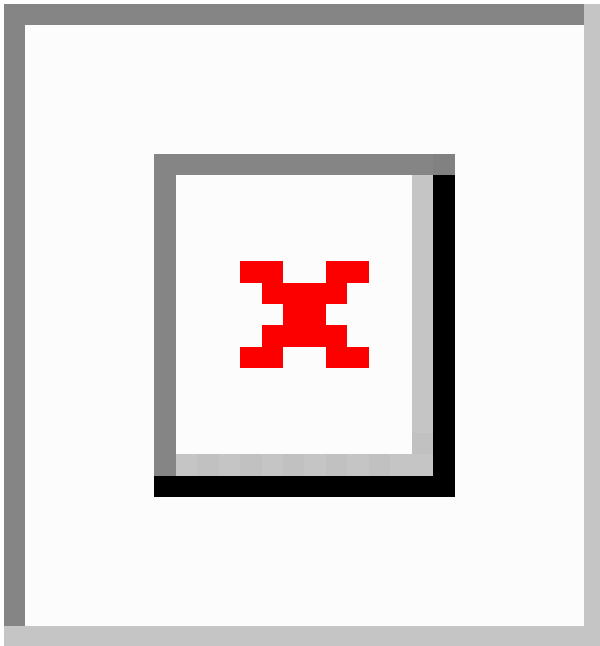
Cards with Internal-Lock Bracket Extraction

Info

Please note that the following images are for illustration purposes only.

1. Verify that the system is powered off and unplugged.

2. Wait 30 seconds.
3. Gently extract the adapter card from the server.

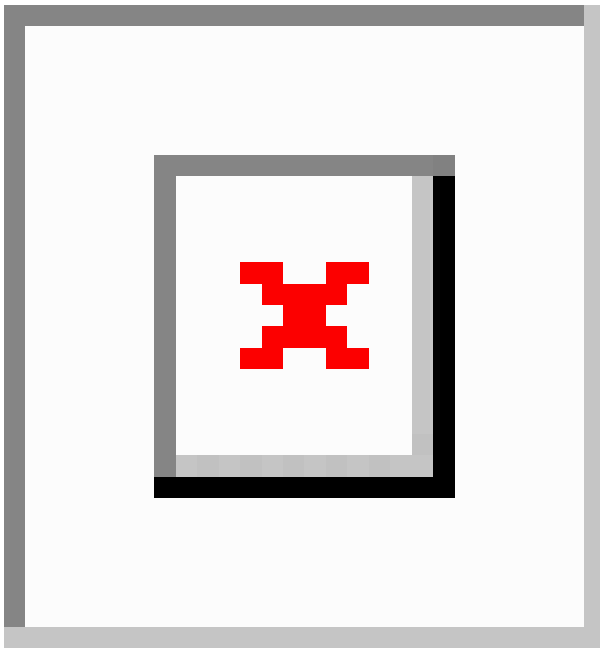


Cards with Ejector Latch Extraction

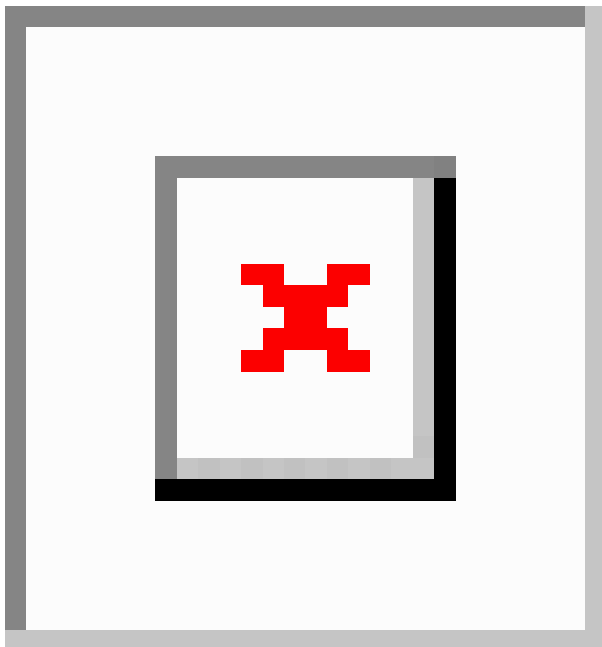
Info

Please note that the following images are for illustration purposes only.

1. Verify that the system is powered off and unplugged.
2. Wait 30 seconds.
3. Open the ejector latch.



4. Gently extract the adapter card from the server.



Driver Installation

Please use the relevant driver installation section.

- [Linux Driver Installation](#)
- [VMware Driver Installation](#)
- [Windows Driver Installation](#)

Linux Driver Installation

This section describes how to install and test the MLNX_OFED for Linux package on a single server with a NVIDIA ConnectX-6 Dx adapter card installed.

Prerequisites

Requirements	Description
Platforms	A server platform with ConnectX®-6 Dx (EN) (firmware: fw-ConnectX6 Dx)
Required Disk Space for Installation	1GB
Operating System	Linux operating system. For the list of supported operating system distributions and kernels, please refer to the <i>MLNX_OFED Release Notes</i> file.
Installer Privileges	The installation requires administrator (root) privileges on the target machine.

Downloading MLNX_OFED

1. Verify that the system has a NVIDIA network adapter installed.

The following example shows a system with an installed NVIDIA adapter card:

```
# lspci -v | grep Mellanox
86:00.0 Network controller [0207]: Mellanox Technologies
Family
        Subsystem: Mellanox Technologies Device 0014
86:00.1 Network controller [0207]: Mellanox Technologies
Family
        Subsystem: Mellanox Technologies Device 0014
```

For Linux driver installation, please refer to [NVIDIA DOCA Installation Guide for Linux](#).

VMware Driver Installation

This section describes VMware Driver Installation.

Hardware and Software Requirements

Requirement	Description
Platforms	A server platform with an adapter card based on ConnectX®-6 Dx (EN) (firmware: fw-ConnectX6 Dx)
Operating System	ESXi 6.5
Installer Privileges	The installation requires administrator privileges on the target machine.

Installing NATIVE ESXi Driver for VMware vSphere

Note

Please uninstall all previous driver packages prior to installing the new version.

To install the driver:

1. Log into the ESXi server with root permissions.
2. Install the driver.

```
#> esxcli software vib install -d <path>/<bundle_file>
```

Example:

```
#> esxcli software vib install -d /tmp/MLNX-NATIVE-ESX-ConnectX-4-5_4.16.8.8-10EM-650.0.0.4240417.zip esxcli
```

3. Reboot the machine.
4. Verify the driver was installed successfully.

```
esxcli software vib list | grep nmlx
nmlx5-core          4.16.8.8-10EM.650.0.0.4240417    MEL
PartnerSupported   2017-01-31
nmlx5-rdma          4.16.8.8-10EM.650.0.0.4240417    MEL
PartnerSupported   2017-01-31
```

Note

After the installation process, all kernel modules are loaded automatically upon boot.

Removing Earlier NVIDIA Drivers

Note

Please unload the previously installed drivers before removing them.

To remove all the drivers:

1. Log into the ESXi server with root permissions.
2. List all the existing NATIVE ESXi driver modules. (See Step 4 in [Installing NATIVE ESXi Driver for VMware vSphere.](#))
3. Remove each module:

```
#> esxcli software vib remove -n nmlx5-rdma  
#> esxcli software vib remove -n nmlx5-core
```

Note

To remove the modules, you must run the command in the same order as shown in the example above.

4. Reboot the server.

Firmware Programming

1. Download the VMware bootable binary images v4.6.0 from the [Firmware Tools \(MFT\) site](#).
 1. ESXi 6.5 File: mft-4.6.0.48-10EM-650.0.0.4598673.x86_64.vib
 2. MD5SUM: 0804cffe30913a7b4017445a0f0adbe1

2. Install the image according to the steps described in the [MFT User Manual](#).

Note

The following procedure requires custom boot image downloading, mounting and booting from a USB device.

Windows Driver Installation

For Windows, download and install the latest WinOF-2 for Windows software package available via the NVIDIA website at: [WinOF-2 webpage](#). Follow the installation instructions included in the download package (also available from the download page).

The snapshots in the following sections are presented for illustration purposes only. The installation interface may slightly vary, depending on the operating system in use.

Software Requirements

For the full list of supported operating systems, please refer to the [WinOF-2 Documentation](#) -> Release Notes.

Downloading WinOF-2 Driver

➤ ***To download the .exe file according to your Operating System, please follow the steps below:***

1. Obtain the machine architecture.
 1. To go to the Start menu, position your mouse in the bottom-right corner of the Remote Desktop of your screen.
 2. Open a CMD console (Click Task Manager-->File --> Run new task and enter CMD).
 3. Enter the following command.

```
echo %PROCESSOR_ARCHITECTURE%
```

Note

On an x64 (64-bit) machine, the output will be “AMD64”.

2. Go to the WinOF-2 web page at: [https://www.nvidia.com/en-us/networking/Products > Software > InfiniBand Drivers \(Learn More\) > Nvidia WinOF-2](https://www.nvidia.com/en-us/networking/Products/Software/InfiniBand%20Drivers%20(Learn%20More)/Nvidia%20WinOF-2).
3. Download the .exe image according to the architecture of your machine (see [Step 1](#)).

The name of the .exe is in the following format: MLNX_WinOF2-
<version>_<arch>.exe.

Note

Installing the incorrect .exe file is prohibited. If you do so, an error message will be displayed.

For example, if you install a 64-bit .exe on a 32-bit machine, the wizard will display the following (or a similar) error message: “The installation package is not supported by this processor type. Contact your vendor”

Installing WinOF-2 Driver

The snapshots in the following sections are for illustration purposes only. The installation interface may slightly vary, depending on the used operating system.

This section provides instructions for two types of installation procedures, and both require administrator privileges:

- [Attended Installation](#)

An installation procedure that requires frequent user intervention.

- Unattended Installation

An automated installation procedure that requires no user intervention.

Attended Installation

The following is an example of an installation session.

1. Double click the .exe and follow the GUI instructions to install MLNX_WinOF2.
2. **[Optional]** Manually configure your setup to contain the logs option (replace "LogFile" with the relevant directory).

```
MLNX_WinOF2_<revision_version>_All_Arch.exe /v" /l*vx  
[LogFile]"
```

3. **[Optional]** If you do not want to upgrade your firmware version (i.e., MT_SKIPFWUPGRD default value is False).

```
MLNX_WinOF2_<revision_version>_All_Arch.exe /v" MT_SKIPFWUPGRD=1"
```

4. **[Optional]** If you do not want to install the Rshim driver, run.

```
MLNX_WinOF2_<revision_version>_All_Arch.exe /v"  
MT_DISABLE_RSHIM_INSTALL=1"
```

Note

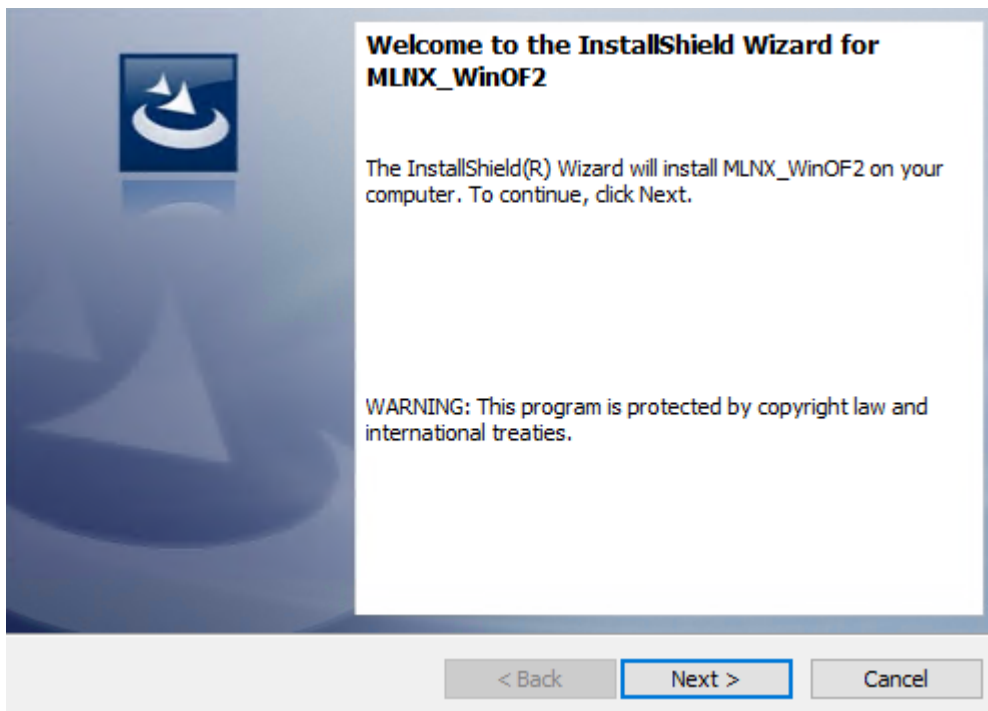
The Rshim driver installation will fail if a prior Rshim driver is already installed. The following fail message will be displayed in the log:

"ERROR!!! Installation failed due to following errors: MlxRshim drivers installation disabled and MlxRshim drivers Installed, Please remove the following oem inf files from driver store: <oem inf list>"

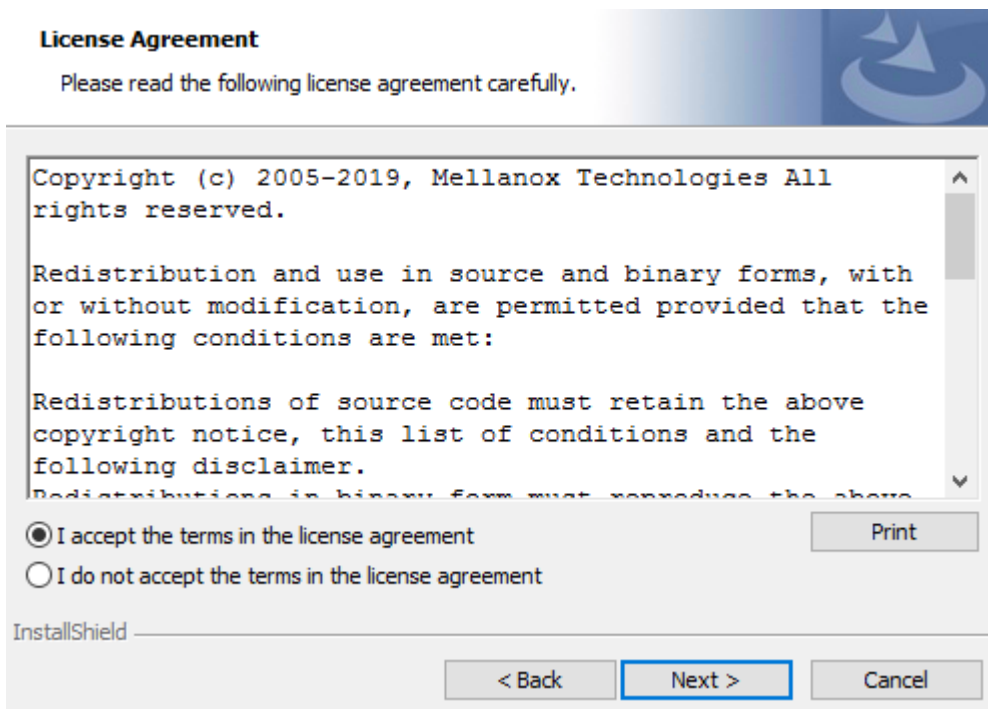
5. **[Optional]** If you want to skip the check for unsupported devices, run.

```
MLNX_WinOF2_<revision_version>_All_Arch.exe /v"  
SKIPUNSUPPORTEDDEVCHECK=1"
```

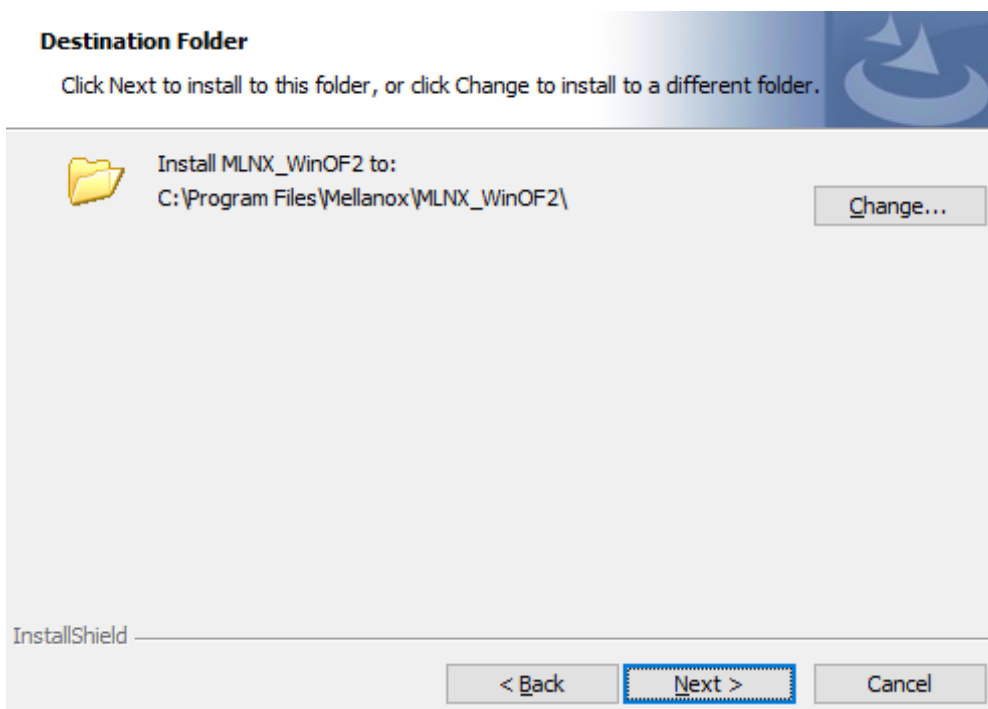
6. Click Next in the Welcome screen.



7. Read and accept the license agreement and click Next.



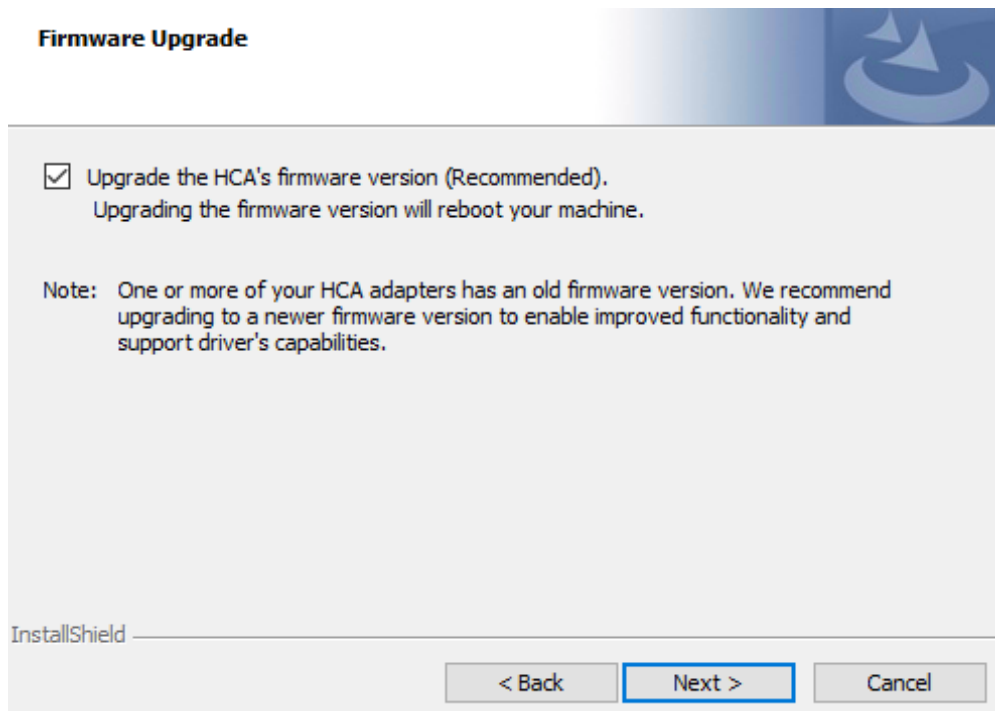
8. Select the target folder for the installation.



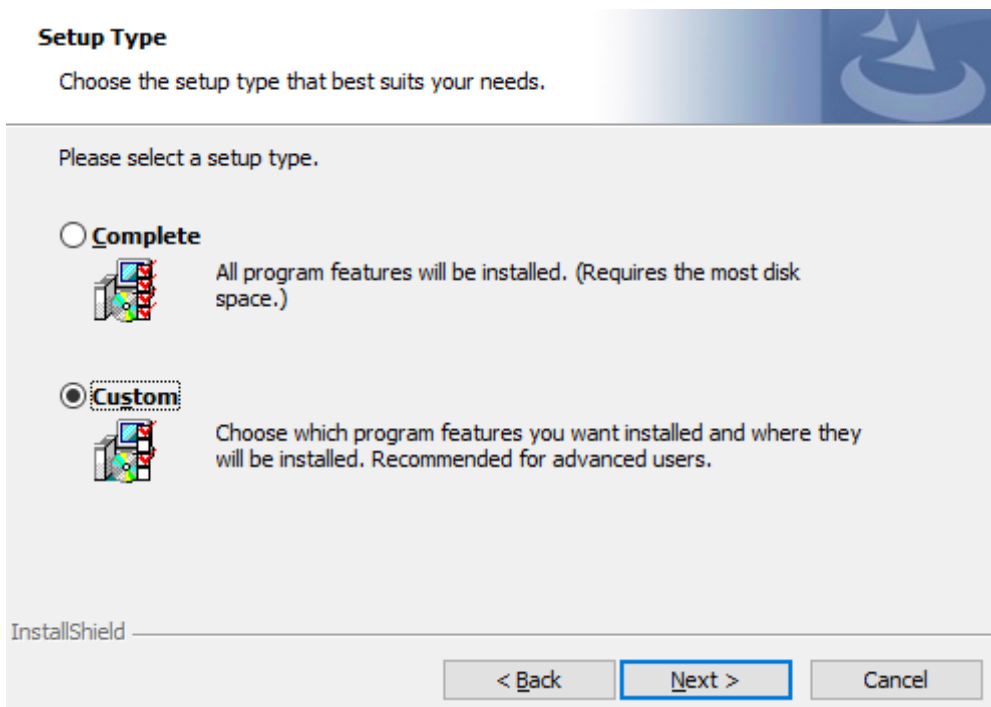
9. The firmware upgrade screen will be displayed in the following cases:

- If the user has an OEM card. In this case, the firmware will not be displayed.
- If the user has a standard NVIDIA® card with an older firmware version, the firmware will be updated accordingly. However, if the user has both an OEM

card and a NVIDIA® card, only the NVIDIA® card will be updated.



10. Select a Complete or Custom installation, follow [Step a](#) onward.

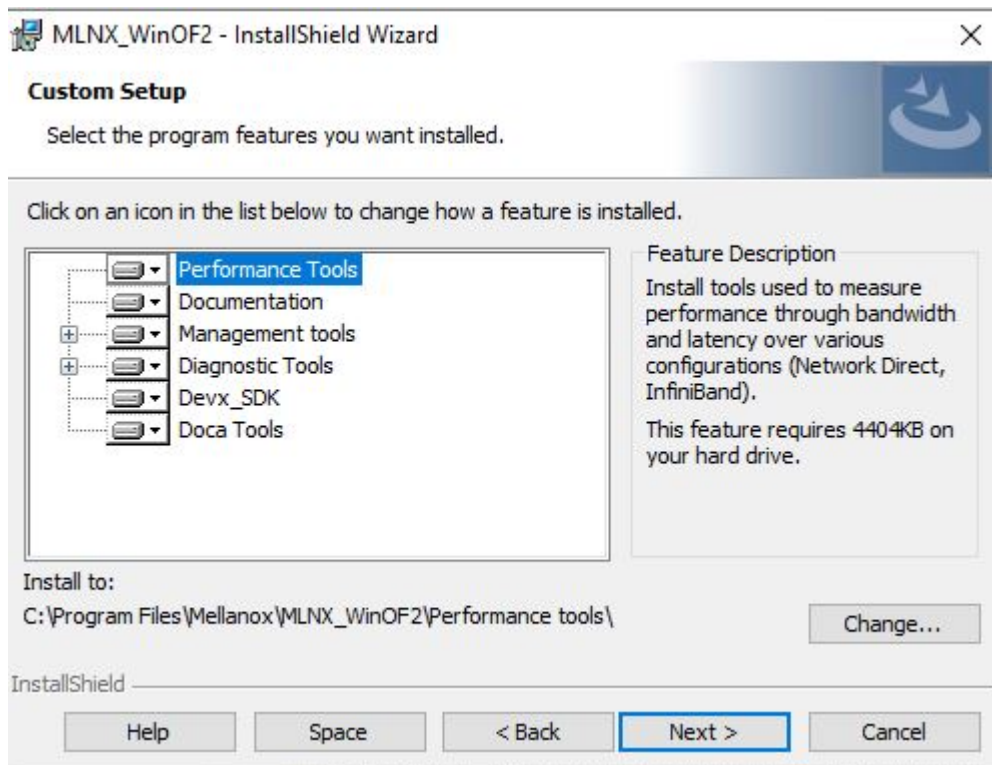


1. Select the desired feature to install:

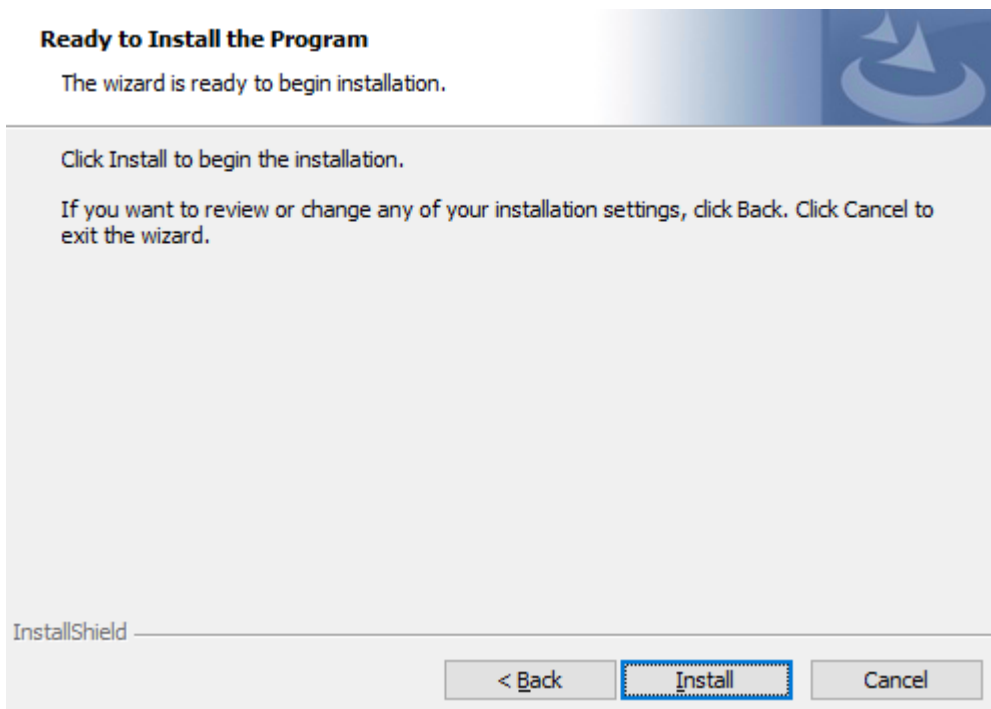
- Performances tools - install the performance tools that are used to measure performance in user environment

- Documentation - contains the User Manual and Release Notes
- Management tools - installation tools used for management, such as mlxstat
- Diagnostic Tools - installation tools used for diagnostics, such as mlx5cmd

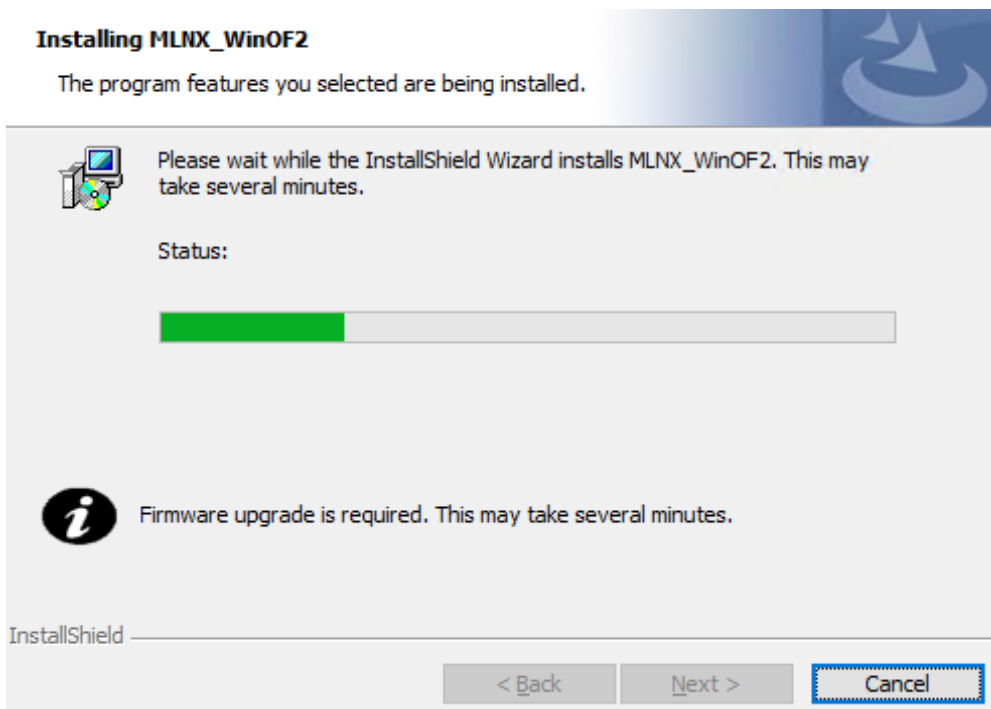
2. Click Next to install the desired tools.



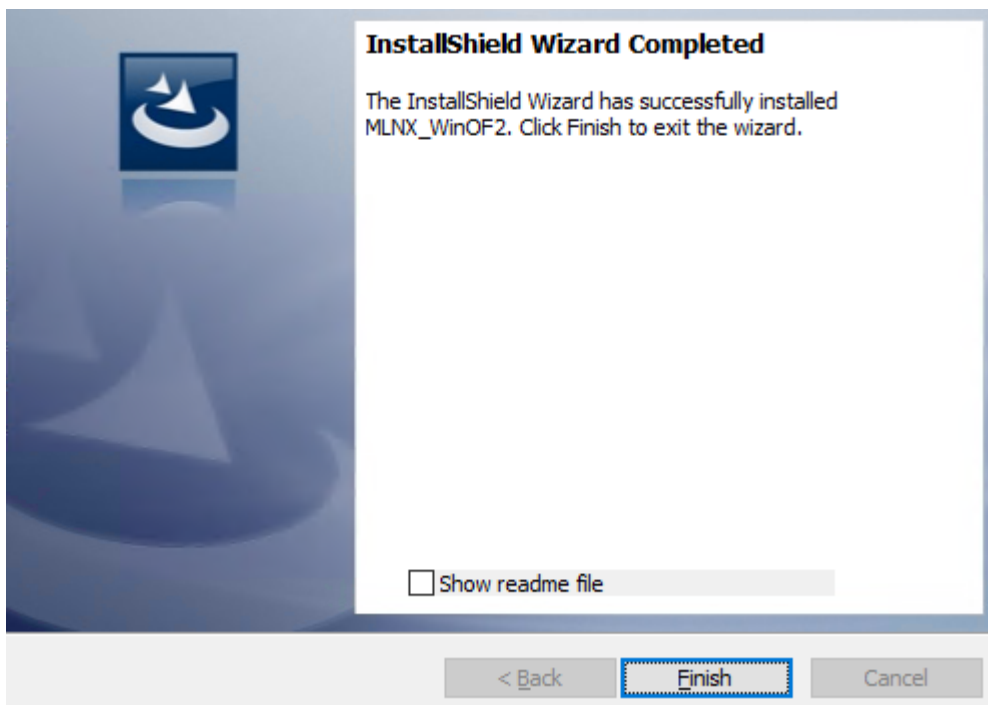
11. Click Install to start the installation.



12. In case firmware upgrade option was checked in [Step 7](#), you will be notified if a firmware upgrade is required (see ).



13. Click Finish to complete the installation.



Unattended Installation

Note

If no reboot options are specified, the installer restarts the computer whenever necessary without displaying any prompt or warning to the user.

To control the reboots, use the */norestart* or */forcerestart* standard command-line options.

The following is an example of an unattended installation session.

1. Open a CMD console-> Click Start-> Task Manager File-> Run new task-> and enter CMD.
2. Install the driver. Run:

```
MLNX_WinOF2-[Driver/Version]_<revision_version>_All_Arch.exe  
/S /v/qn
```

3. **[Optional]** Manually configure your setup to contain the logs option:

```
MLNX_WinOF2-[Driver/Version]_<revision_version>_All_Arch.exe  
/S /v/qn /v"/l*vx [LogFile]"
```

4. **[Optional]** if you wish to control whether to install ND provider or not (i.e., *MT_NDPROPERTY* default value is *True*).

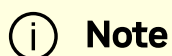
```
MLNX_WinOF2-[Driver/Version]_<revision_version>_All_Arch.exe  
/vMT_NDPROPERTY=1
```

5. **[Optional]** If you do not wish to upgrade your firmware version (i.e., *MT_SKIPFWUPGRD* default value is *False*).

```
MLNX_WinOF2-[Driver/Version]_<revision_version>_All_Arch.exe  
/vMT_SKIPFWUPGRD=1
```

6. **[Optional]** If you do not want to install the Rshim driver, run.

```
MLNX_WinOF2_<revision_version>_All_Arch.exe /v"  
MT_DISABLE_RSHIM_INSTALL=1"
```



The Rshim driver installation will fail if a prior Rshim driver is already installed. The following fail message will be displayed in the log:

"ERROR!!! Installation failed due to following errors: MlxRshim drivers installation disabled and MlxRshim drivers Installed, Please remove the following oem inf files from driver store: <oem inf list>"

7. **[Optional]** If you want to enable the default configuration for Rivermax, run.

```
MLNX_WinOF2_<revision_version>_All_Arch.exe /v"MT_RIVERMAX=1 /!*vx  
C:\Users\<user>\log.txt "
```

8. **[Optional]** If you want to skip the check for unsupported devices, run/

```
MLNX_WinOF2_<revision_version>_All_Arch.exe /v"  
SKIPUNSUPPORTEDDEVCHECK=1"
```

Firmware Upgrade

If the machine has a standard NVIDIA® card with an older firmware version, the firmware will be automatically updated as part of the NVIDIA® WinOF-2 package installation. For information on how to upgrade firmware manually, please refer to [MFT User Manual](#).

If the machine has a DDA (pass through) facility, firmware update is supported only in the Host. Therefore, to update the firmware, the following must be performed:

1. Return the network adapters to the Host.
2. Update the firmware according to the steps in the [MFT User Manual](#).
3. Attach the adapters back to VM with the DDA tools.

Updating Adapter Firmware

Each adapter card is shipped with the latest version of qualified firmware at the time of manufacturing. However, NVIDIA issues firmware updates occasionally that provide new features and bug fixes. To check that your card is programmed with the latest available firmware version, download the mlxup firmware update and query utility. The utility can query for available NVIDIA adapters and indicate which adapters require a firmware update. If the user confirms, mlxup upgrades the firmware using embedded images. The latest mlxup executable and documentation are available in [mlxup - Update and Query Utility](#).

Firmware Update Example

```
[server1]# ./mlxup
Querying Mellanox devices firmware ...
Device Type:      ConnectX-6 Dx
Part Number:      MCX623436AC-CDAB
Description:      ConnectX®-6 Dx EN adapter card, 100GbE, OCP3.0,
                  With Host Management, Dual-port QSFP56, PCIe 4.0 x16, Crypto and
                  Secure Boot, Thumbscrew (Pull Tab) Bracket
PSID:             MT_2190110032
PCI Device Name:  0000:06:00.0
Base GUID:        e41d2d0300fd8b8a
Versions:         Current          Available
                  FW 16.00.0000    16.00.0000

Status:           Up to date
Device Type:      ConnectX-6 Dx
Part Number:      MCX623436AC-CDAB
Description:      ConnectX®-6 Dx EN adapter card, 100GbE, OCP3.0,
                  With Host Management, Dual-port QSFP56, PCIe 4.0 x16, Crypto and
                  Secure Boot, Thumbscrew (Pull Tab) Bracket
PCI Device Name:  0000:07:00.0
Base MAC:         0000e41d2da206d4
```

Versions:	Current	Available
	FW 16.20.1000	16.24.1000

Status: Update required

Perform FW update? [y/N]: y

Device #1: Up to date

Device #2: Updating FW ... Done

Restart needed for updates to take effect.

Log File: /var/log/mlxup/mlxup-yyyymmdd.log

Troubleshooting

General Troubleshooting

Server unable to find the adapter	• Ensure that the adapter is placed correctly • Make sure the adapter slot and the adapter are compatible Install the adapter in a different PCI Express slot • Use the drivers that came with the adapter or download the latest • Make sure your motherboard has the latest BIOS • Try to reboot the server
The adapter no longer works	• Reseat the adapter in its slot or a different slot, if necessary • Try using another cable • Reinstall the drivers for the network driver files may be damaged or deleted • Reboot the server
Adapters stopped working after installing another adapter	• Try removing and re-installing all adapters • Check that cables are connected properly • Make sure your motherboard has the latest BIOS

Link indicator light is off	• Try another port on the switch • Make sure the cable is securely attached • Check you are using the proper cables that do not exceed the recommended lengths • Verify that your switch and adapter port are compatible
Link light is on, but with no communication established	• Check that the latest driver is loaded • Check that both the adapter and its link are set to the same speed and duplex settings
Event message received of insufficient power	• When [adapter's current power consumption] > [PCIe slot advertised power limit] – a warning message appears in the server's system even logs (Eg. dmesg: "Detected insufficient power on the PCIe slot") • It's recommended to use a PCIe slot that can supply enough power. • If a message of the following format appears – "mlx5_core 0003:01:00.0: port_module:254:(pid 0): Port module event[error]: module 0, Cable error, One or more network ports have been powered down due to insufficient/unadvertised power on the PCIe slot" please upgrade your Adapter's firmware. • If the message remains – please consider switching from Active Optical Cable (AOC) or transceiver to Direct Attached Copper (DAC) connectivity.

Linux Troubleshooting

Environment Information	<pre>cat /etc/issue uname -a cat /proc/cupinfo grep 'model name' uniq</pre>
-------------------------	---

	ofed_info -s ifconfig -a ip link show ethtool <interface> ethtool -i <interface_of_Mellanox_port_num> ibdev2netdev
Card Detection	lspci grep -i Mellanox
Mellanox Firmware Tool (MFT)	Download and install MFT: MFT Documentation Refer to the User Manual for installation instructions. Once installed, run: mst start mst status flint -d <mst_device> q
Ports Information	ibstat ibv_devinfo
Firmware Version Upgrade	To download the latest firmware version, refer to the NVIDIA Update and Query Utility .
Collect Log File	cat /var/log/messages dmesg >> system.log journalctl (Applicable on new operating systems) cat /var/log/syslog

Windows Troubleshooting

Environment Information	From the Windows desktop choose the Start menu and run: <code>msinfo32</code> To export system information to a text file, choose the Export option from the File menu. Assign a file name and save.
Mellanox Firmware Tool (MFT)	Download and install MFT: MFT Documentation Refer to the User Manual for installation instructions.

	Once installed, open a CMD window and run: <pre>WinMFT mst start mst status flint -d <mst_device> q</pre>
Ports Information	vstat
Firmware Version Upgrade	Download the latest firmware version using the PSID/board ID from here. <pre>flint -d <mst_device> -i <firmware_bin_file> b</pre>
Collect Log File	• Event log viewer • MST device logs: ◦ mst start ◦ mst status • flint -d <mst_device> dc > dump_configuration.log • mstdump <mst_device> dc > mstdump.log

Specifications

Note

1. Install the ConnectX-6 Dx OCP 3.0 card in a PCIe slot that is capable of supplying the power levels mentioned below for the appropriate use case.
2. ConnectX-6 Dx adapters supplement the auto-negotiation specification to get better bit error rates and longer cable reaches. This supplemental feature only initiates when connected to another NVIDIA Ethernet product.
3. In Standby mode only port0 is available.

Note

Power numbers are provided for passive cables only. For board power numbers while using active cables, please add the outcome of the following formula to the passive cables' power numbers stated below.

Power while using Active Cables = Card Power with Passive Cable + Active Module Power $\times$ Number_of_Modules / 0.9 (efficiency factor).

MCX623432AE-ADAB / MCX623432AN-ADAB / MCX623432AC-ADAB / MCX623432AS-ADAB Specifications

Physical

Form Factor: Small Form Factor (SFF) OCP 3.0
Size: 4.52 in. x 2.99 in (115.00mm x 76.00mm)

	Connector: Dual SFP28 Ethernet (copper and optical)					
	Retention Mechanism: Thumbscrew (Pull Tab) Bracket					
Protocol Support	Ethernet: 25GBASE-R, 20GBASE-KR2, 10GBASE-LR, 10GBASE-ER, 10GBASE-CX4, 10GBASE-KX4, 10GBASE-CR, 10GBASE-KR, SGMII, 1000BASE-CX, 1000BASE-KX, 10GBASE-SR					
	Data Rate:	Ethernet	1/10/25 Gb/s			
	PCI Express Gen 4.0: SERDES @ 16.0GT/s, 16 lanes (2.0 and 1.1 compatible)					
Capabilities	MCX623432AE-ADAB: Crypto Enabled, No Secure Boot MCX623432AN-ADAB: Crypto Disabled, No Secure Boot MCX623432AC-ADAB: Crypto Enabled, Secure Boot MCX623432AS-ADAB: Crypto Disabled, Secure Boot					
Power and Airflow	Voltage: 3.3VAUX, 12V					
		Cable Type	Active Mode		Standby Mode	
	Typical Power^(a)	Passive Cables	15.7W		3.8W	
	Maximum Power	Passive Cables	19.74W		7.95W	
	Maximum power available through SFP28 port: 1.5W					
	Airflow	Cable Type	Hot Aisle HSK to Port		Cold Aisle Port to HSK	
		Passive Cable	Active Mode @55C	Standby Mode @45C	Active Mode @35C	Standby Mode @35C
			400LFM	100LFM	TBD	TBD
		Active 0.8W NVIDIA Cable	400LFM	100LFM	TBD	TBD
		Active 1.5W Cable	500LFM	150LFM	TBD	TBD
Environmental	Temperature	Operational	0°C to 55°C			
		Non-operational	-40°C to 70°C			

	Humidity	Operational	10% to 85% relative humidity
		Non-operational	10% to 90% relative humidity ^(b)
	Altitude (Operational)	3050m	
Regulatory	Safety	CB / cTUVus / CE	
	EMC	CE / FCC / VCCI / ICES / RCM	
	RoHS	RoHS compliant	
a. Typical power for ATIS traffic load.			
b. The non-operational storage temperature specifications apply to the product without its package.			

MCX623432AC-GDAB / MCX623432AN-GDAB / MCX623432AS-GDAI Specifications

Physical	Form Factor: Small Form Factor (SFF) OCP 3.0 Size: 4.52 in. x 2.99 in (115.00mm x 76.00mm)			
	Connector: Dual SFP56 Ethernet (copper and optical)			
	Retention Mechanism:	MCX623432A[N/C]-GDAB: Thumbscrew (Pull Tab) Bracket		
MCX623432AS-GDAI: Internal Lock				
Protocol Support	Ethernet: 50GBASE-R2, 50GBASE-R4, 40GBASE-CR4, 40GBASE-KR4, 40GBASE-SR4, 40GBASE-LR4, 40GBASE-ER4, 40GBASE-R2, 25GBASE-R, 20GBASE-KR2, 10GBASE-LR, 10GBASE-ER, 10GBASE-CX4, 10GBASE-CR, 10GBASE-KR, SGMII, 1000BASE-CX, 1000BASE-KX, 10GBASE-SR			
	Data Rate	Ethernet	1/10/25/40/50 Gb/s	
	PCI Express Gen 4.0: SERDES @ 16.0GT/s, 16 lanes (2.0 and 1.1 compatible)			
Capabilities	MCX623432AC-GDAB: Crypto Enabled, Secure Boot MCX623432AN-GDAB: Crypto Disabled, No Secure Boot MCX623432AS-GDAI: Crypto Disabled, Secure Boot			
Power and Airflow	Voltage: 3.3VAUX, 12V			
	Power	Cable Type	Active Mode	Standby Mode

	Typical Power ^(a)	Passive Cables	16.9W		4.54W	
	Maximum Power	Passive Cables	21.4W		8.75W	
	Maximum power available through SFP56 port: 2W					
	Airflow	Cable Type	Hot Aisle HSK to Port		Cold Aisle Port to HSK	
			Active Mode @55C	Standby Mode @45C	Active Mode @35C	Standby Mode @35C
Passive Cable		400LFM	100LFM	TBD	TBD	
Active 2W Cable	800LFM	200LFM	TBD	TBD		
Environmental	Temperature	Operational	0°C to 55°C			
		Non-operational	-40°C to 70°C			
	Humidity	Operational	10% to 85% relative humidity			
		Non-operational	10% to 90% relative humidity ^(b)			
	Altitude (Operational)	3050m				
Regulatory	Safety	CB / cTUVus / CE				
	EMC	CE / FCC / VCCI / ICES / RCM				
	RoHS	RoHS compliant				
a. Typical power for ATIS traffic load. b. The non-operational storage temperature specifications apply to the product without its package.						

MCX623435MN-CDAB Specifications

Physical	Form Factor: Small Form Factor (SFF) OCP 3.0						
	Size: 4.52 in. x 2.99 in (115.00mm x 76.00mm)						
	Connector: Single QSFP56 Ethernet (copper and optical)						
	Retention Mechanism: Thumbscrew (Pull Tab) Bracket						
Capabilities	Multi-Host or Socket Direct, Crypto Disabled, No Secure Boot						
Protocol Support	Ethernet: 100GBASE-CR4, 100GBASE-KR4, 100GBASE-SR4, 100GBASE-CR2, 100GBASE-KR2, 100GBASE-SR2, 50GBASE-R2, 50GBASE-R4, 40GBASE-CR4, 40GBASE-KR4, 40GBASE-SR4, 40GBASE-LR4, 40GBASE-ER4, 40GBASE-R2, 25GBASE-R, 20GBASE-KR2, 10GBASE-LR, 10GBASE-ER, 10GBASE-CX4, 10GBASE-CR, 10GBASE-KR, SGMII, 1000BASE-CX, 1000BASE-KX, 10GBASE-SR						
	Data Rate:	Ethernet	1/10/25/40/50/100 Gb/s				
	PCI Express Gen 4.0: SERDES @ 16.0GT/s, 16 lanes (2.0 and 1.1 compatible)						
Power and Airflow	Voltage: 3.3VAUX, 12V						
	Power	Cable Type	Active Mode		Standby Mode		
	Typical Power^(a)	Passive Cables	18W		5.7W		
	Maximum Power	Passive Cables	23.4W		10W		
	Maximum power available through QSFP56 port: 5W						
	Airflow	Cable Type	Hot Aisle HSK to Port		Cold Aisle Port to HSK		
			Active Mode	Standby Mode @45 °C	Active Mode @35C	Standby Mode @35C	
			Passive Cable	500LFM @55 °C	100LFM	300LFM	100LFM
			Active 2.2W NVIDIA Cable	700LFM @55 °C	200LFM	300LFM	100LFM
		Active 3.5W Cable	700LFM @50 °C	300LFM	300LFM	100LFM	

Environmental	Temperature	Operational	0°C to 55°C
		Non-operational	-40°C to 70°C
	Humidity	Operational	10% to 85% relative humidity
		Non-operational	10% to 90% relative humidity ^(b)
	Altitude (Operational)	3050m	
Regulatory	Safety	CB / cTUVus / CE	
	EMC	CE / FCC / VCCI / ICES / RCM	
	RoHS	RoHS compliant	

a. Typical power for ATIS traffic load.

b. The non-operational storage temperature specifications apply to the product without its package.

MCX623439MC-CDAB / MCX623439MN-CDAB Specifications

Physical	Form Factor: Small Form Factor (SFF) OCP 3.0 Size: 4.52 in. x 2.99 in (115.00mm x 76.00mm)	
	Connector: Single-port QSFP56	
	Retention Mechanism:	Thumbscrew (Pull Tab) Bracket
Capabilities	MCX623439MC-CDAB: Multi Host or Socket Direct, Crypto Enabled, Secure Boot MCX623439MN-CDAB: Multi Host or Socket Direct, Crypto Disables, Secure Boot	
Protocol Support	Ethernet: 100GBASE-CR4, 100GBASE-KR4, 100GBASE-SR4, 100GBASE-CR2, 100GBASE-KR2, 100GBASE-SR2, 50GBASE-R2, 50GBASE-R4, 40GBASE-CR4, 40GBASE-KR4, 40GBASE-SR4, 40GBASE-LR4, 40GBASE-ER4, 40GBASE-R2, 25GBASE-R, 20GBASE-KR2, 10GBASE-LR, 10GBASE-ER, 10GBASE-CX4, 10GBASE-CR, 10GBASE-KR, SGMII, 1000BASE-CX, 1000BASE-KX, 10GBASE-SR	

	Data Rate:	Ethernet	1/10/25/40/50/100 Gb/s			
	PCI Express Gen 4.0: SERDES @ 16.0GT/s, 16 lanes (2.0 and 1.1 compatible)					
Power and Environmental	Voltage: 3.3VAUX, 12V					
	Power	Cable Type	Active Mode		Standby Mode	
	Typical Power^(a)	Passive Cables	17.22W		4.3W	
	Maximum Power	Passive Cables	22.77W		8.1W	
	Maximum power available through QSFP56 port: 5W					
	Airflow	Cable Type	Hot Aisle HSK to Port		Cold Aisle Port to HSK	
			Active Mode @55C	Standby Mode @45C	Active Mode @35C	Standby Mode @35C
		Passive Cable	600LFM	100LFM	Not Supported	Not Supported
	Active Cables	TBD	TBD	TBD	TBD	
Environmental	Temperature	Operational	0°C to 55°C			
		Non-operational	-40°C to 70°C			
	Humidity	Operational	10% to 85% relative humidity			
		Non-operational	10% to 90% relative humidity ^(b)			
	Altitude (Operational)	3050m				
Regulatory	Safety	CB / cTUVus / CE				
	EMC	CE / FCC / VCCI / ICES / RCM				
	RoHS	RoHS compliant				
a. Typical power for ATIS traffic load.						

b. The non-operational storage temperature specifications apply to the product without its package.

MCX623436AC-CDAB / MCX623436AN-CDAB / MCX623436AS-CDAl Specifications

Physical	Form Factor: Small Form Factor (SFF) OCP 3.0 Size: 4.52 in. x 2.99 in (115.00mm x 76.00mm)				
	Connector: Dual QSFP56 Ethernet (copper and optical)				
	Retention Mechanism	MCX623436A[N/C]-CDAB: Thumbscrew (Pull Tab) Bracket			
		MCX623436AS-CDAl: Internal Lock Bracket			
Capabilities	MCX623436AC-CDAB ^(a) : Crypto Enabled, Secure Boot, with Host Management MCX623436AN-CDAB: Crypto Disabled, No Secure Boot, with Host Management MCX623436AS-CDAl: Crypto Disabled, Secure Boot, with Host Management				
Protocol Support	Ethernet: 100GBASE-CR4, 100GBASE-KR4, 100GBASE-SR4, 100GBASE-CR2, 100GBASE-KR2, 100GBASE-SR2, 50GBASE-R2, 50GBASE-R4, 40GBASE-CR4, 40GBASE-KR4, 40GBASE-SR4, 40GBASE-LR4, 40GBASE-ER4, 40GBASE-R2, 25GBASE-R, 20GBASE-KR2, 10GBASE-LR, 10GBASE-ER, 10GBASE-CX4, 10GBASE-CR, 10GBASE-KR, SGMII, 1000BASE-CX, 1000BASE-KX, 10GBASE-SR				
	Data Rate:	Ethernet	1/10/25/40/50/100 Gb/s		
	PCI Express Gen 4.0: SERDES @ 16.0GT/s, 16 lanes (2.0 and 1.1 compatible)				
Power and Airflow	Voltage: 3.3VAUX, 12V				
	Power	Cable Type	Active Mode	Standby Mode	
	Typical Power (b)	Passive Cables	19W	5.7W	
	Maximum Power	Passive Cables	26.6W	10W	
	Maximum power available through QSFP56 port: 5W				

	Airflow	Cable Type	Hot Aisle HSK to Port		Cold Aisle @35C Port to HSK		
			Active Mode	Standby Mode @45C	Active Mode @35C	Standby Mode @35C	
		Passive Cable	600LFM @55C	100LFM	Not Supported	Not Supported	
		Active 2.2W NVIDIA Cables	1000LFM @55C	300LFM	Not Supported	Not Supported	
		Active 3.5W	800LFM @50C	500LFM	Not Supported	Not Supported	
Environmental	Temperature	Operational	0°C to 55°C				
		Non-operational	-40°C to 70°C ^(b)				
	Humidity	Operational	10% to 85% relative humidity				
		Non-operational	10% to 90% relative humidity				
	Altitude (Operational)	3050m					
Regulatory	Safety	CB / cTUVus / CE					
	EMC	CE / FCC / VCCI / ICES / RCM					
	RoHS	RoHS compliant					
(a) If your target application for this crypto-enabled card will utilize 100Gb/s or higher bandwidth, where a substantial part of the bandwidth will be allocated for IPsec traffic, please refer to the NVIDIA BlueField-2 DPUs Release Notes document to learn about a potential bandwidth							

limitation. See [Related Documents](#) section for details on accessing the document. Typical power for ATIS traffic load.

(b) The non-operational storage temperature specifications apply to the product without its package.

MCX623436MN-CDAB / MCX623436MS-CDAB Specifications

Physical	Form Factor: Small Form Factor (SFF) OCP 3.0 Size: 4.52 in. x 2.99 in (115.00mm x 76.00mm)			
	Connector: Dual QSFP56 Ethernet (copper and optical)			
	Retention Mechanism	Thumbscrew (Pull Tab) Bracket		
Capabilities	- MCX623436MN-CDAB: Crypto disabled, Secure Boot disabled, with Multi-Host or Socket Direct - MCX623436MS-CDAB: Crypto disabled, Secure Boot enabled, with Multi-Host or Socket Direct			
Protocol Support	Ethernet: 100GBASE-CR4, 100GBASE-KR4, 100GBASE-SR4, 100GBASE-CR2, 100GBASE-KR2, 100GBASE-SR2, 50GBASE-R2, 50GBASE-R4, 40GBASE-CR4, 40GBASE-KR4, 40GBASE-SR4, 40GBASE-LR4, 40GBASE-ER4, 40GBASE-R2, 25GBASE-R, 20GBASE-KR2, 10GBASE-LR, 10GBASE-ER, 10GBASE-CX4, 10GBASE-CR, 10GBASE-KR, SGMII, 1000BASE-CX, 1000BASE-KX, 10GBASE-SR			
	Data Rate:	Ethernet	1/10/25/40/50/100 Gb/s	
	PCI Express Gen 4.0: SERDES @ 16.0GT/s, 16 lanes (2.0 and 1.1 compatible)			
Power and Airflow	Voltage: 3.3VAUX, 12V			
	Power	Cable Type	Active Mode	Standby Mode
	Typical Power^(a)	Passive Cables	19W	5.7W
	Maximum Power	Passive Cables	26.6W	10W
	Maximum power available through QSFP56 port: 5W			
	Airflow	Cable Type	Hot Aisle HSK to Port	Cold Aisle Port to HSK

			Active Mode	Standby Mode @45C	Active Mode @35C	Standby Mode @35C
		Passive Cable	900LFM @55C	100LFM	Not Supported	Not Supported
		Active 2.2W NVIDIA Cables	700LFM @50C	300LFM	Not Supported	Not Supported
		Active 3.5W	800LFM @45C	500LFM	Not Supported	Not Supported
Environmental	Temperature	Operational	0°C to 55°C			
		Non-operational	-40°C to 70°C			
	Humidity	Operational	10% to 85% relative humidity			
		Non-operational	10% to 90% relative humidity ^(b)			
	Altitude (Operational)	3050m				
Regulatory	Safety	CB / cTUVus / CE				
	EMC	CE / FCC / VCCI / ICES / RCM				
	RoHS	RoHS compliant				
a. Typical power for ATIS traffic load. b. The non-operational storage temperature specifications apply to the product without its package.						

MCX623430MS-CDAB Specifications

Physical	Form Factor: Small Form Factor (SFF) OCP 3.0					
	Size: 4.52 in. x 2.99 in (115.00mm x 76.00mm)					
	Connector: Dual DSFP Ethernet (copper and optical)					
	Retention	Thumbscrew (Pull Tab) Bracket				

	Mechanism :						
Capabilities	MCX623430MS-CDAB: Crypto disabled, Secure Boot enabled, with Multi-Host or Socket Direct						
Protocol Support	Ethernet: 100GBASE-CR4, 100GBASE-KR4, 100GBASE-SR4, 100GBASE-CR2, 100GBASE-KR2, 100GBASE-SR2, 50GBASE-R2, 50GBASE-R4, 40GBASE-CR4, 40GBASE-KR4, 40GBASE-SR4, 40GBASE-LR4, 40GBASE-ER4, 40GBASE-R2, 25GBASE-R, 20GBASE-KR2, 10GBASE-LR,10GBASE-ER, 10GBASE-CX4, 10GBASE-CR, 10GBASE-KR, SGMII, 1000BASE-CX, 1000BASE-KX, 10GBASE-SR						
	Data Rate:	Ethernet	1/10/25/40/50/100 Gb/s				
	PCI Express Gen 4.0: SERDES @ 16.0GT/s, 16 lanes (2.0 and 1.1 compatible)						
Power and Airflow w	Voltage: 3.3VAUX, 12V						
	Power	Cable Type	Active Mode		Standby Mode		
	Typical Power (a)	Passive Cables	19W		5.7W		
	Maximum Power	Passive Cables	26.6W		10W		
	Maximum power available through DSFP port: 5W						
	Airflow w	Cable Type	Hot Aisle HSK to Port		Cold Aisle Port to HSK		
			Active Mode	Standby Mode @45C	Active Mode @35C	Standby Mode @35C	
		Passive Cable	350LFM @55C	100LFM	150LFM	100LFM	
Active 2.5W Cables	400LFM @45C	200LFM	200LFM	100LFM			

Environmental	Temperature	Operational	0°C to 55°C	
		Non-operational	-40°C to 70°C	
	Humidity	Operational	10% to 85% relative humidity	
		Non-operational	10% to 90% relative humidity ^(b)	
	Altitude (Operational)	3050m		
Regulatory	Safety	CB / cTUVus / CE		
	EMC	CE / FCC / VCCI / ICES / RCM		
	RoHS	RoHS compliant		
a. Typical power for ATIS traffic load.				
b. The non-operational storage temperature specifications apply to the product without its package.				

MCX623435AC-CDAB / MCX623435AE-CDAB / MCX623435AN-CDAB Specifications

Physical	Form Factor: Small Form Factor (SFF) OCP 3.0 Size: 4.52 in. x 2.99 in (115.00mm x 76.00mm)	
	Connector: Single QSFP56 Ethernet (copper and optical)	
	Retention Mechanism	Thumbscrew (Pull Tab) Bracket
Capabilities	• MCX623435AC-CDAB^(a): Crypto enabled, Secure Boot enabled, with Host Management • MCX623435AE-CDAB: Crypto enabled, Secure Boot disabled, with Host Management • MCX623435AN-CDAB: Crypto disabled, Secure Boot disabled, with Host Management	

Protocol Support	Ethernet: 200GBASE-CR4, 200GBASE-KR4, 200GBASE-SR4, 100GBASE-CR4, 100GBASE-KR4, 100GBASE-SR4, 100GBASE-CR2, 100GBASE-KR2, 100GBASE-SR2, 50GBASE-R2, 50GBASE-R4, 40GBASE-CR4, 40GBASE-KR4, 40GBASE-SR4, 40GBASE-LR4, 40GBASE-ER4, 40GBASE-R2, 25GBASE-R, 20GBASE-KR2, 10GBASE-LR, 10GBASE-ER, 10GBASE-CX4, 10GBASE-CR, 10GBASE-KR, SGMII, 1000BASE-CX, 1000BASE-KX, 10GBASE-SR						
	Data Rate:		Ethernet	1/10/25/40/50/100/200 Gb/s			
	PCI Express Gen 4.0: SERDES @ 16.0GT/s, 16 lanes (2.0 and 1.1 compatible)						
Power and Airflow	Voltage: 3.3VAUX, 12V						
	Power	Cable Type	Active Mode		Standby Mode		
	Typical Power^(a)	Passive Cables	16.9W		5.6W		
	Maximum Power	Passive Cables	24W		11.4W		
	Maximum power available through QSFP56 port: 5W						
	Airflow	Cable Type	Hot Aisle Heatsink to Port		Cold Aisle Port to Heatsink		
			Active Mode @55C	Standby Mode @45C	Active Mode @35C	Standby Mode @35C	
			Passive Cable	400LFM	100LFM	250LFM	100LFM
			Active 2.2W NVIDIA Cable	700LFM	200LFM	250LFM	100LFM
		Active 3.5W Cable	700LFM ^(b)	300LFM	250LFM	100LFM	
Environmental	Temperature	Operational	0°C to 55°C				
		Non-operational	-40°C to 70°C				
	Humidity	Operational	10% to 85% relative humidity				

		Non-operational	10% to 90% relative humidity ^(c)
	Altitude (Operational)	3050m	
Regulatory	Safety	CB / cTUVus / CE	
	EMC	CE / FCC / VCCI / ICES / RCM	
	RoHS	RoHS compliant	
(a) If your target application for this crypto-enabled card will utilize 100Gb/s or higher bandwidth, where a substantial part of the bandwidth will be allocated for IPsec traffic, please refer to the NVIDIA BlueField-2 DPUs Release Notes document to learn about a potential bandwidth limitation. See Related Documents section for details on accessing the document. Typical power for ATIS traffic load. (b) At 50 ° C ambient, not 55 ° C. (c) The non-operational storage temperature specifications apply to the product without its package.			

MCX623435AC-VDAB / MCX623435AN-VDAB / MCX623435AS-VDAl Specifications

Physical	Form Factor: Small Form Factor (SFF) OCP 3.0 Size: 4.52 in. x 2.99 in (115.00mm x 76.00mm)	
	Connector: Single QSFP56 Ethernet (copper and optical)	
	Retention Mechanism	MCX623435A[N/C]-VDAB: Thumbscrew (Pull Tab) Bracket MCX623435AS-VDAl: Internal Lock
Capabilities	• MCX623435AC-VDAB: Crypto enabled, Secure Boot enabled, with Host Management • MCX623435AN-VDAB: Crypto disabled, Secure Boot disabled, with Host Management • MCX623435AS-VDAl: Crypto disabled, Secure Boot enabled, with Host Management	
Protocol Support	Ethernet: 200GBASE-CR4, 200GBASE-KR4, 200GBASE-SR4, 100GBASE-CR4, 100GBASE-KR4, 100GBASE-SR4, 100GBASE-CR2, 100GBASE-KR2, 100GBASE-SR2, 50GBASE-R2, 50GBASE-R4, 40GBASE-CR4, 40GBASE-KR4, 40GBASE-SR4, 40GBASE-LR4, 40GBASE-ER4, 40GBASE-R2, 25GBASE-R,	

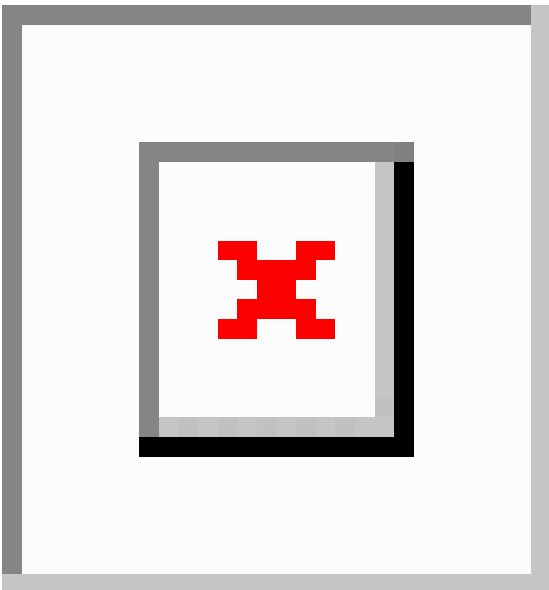
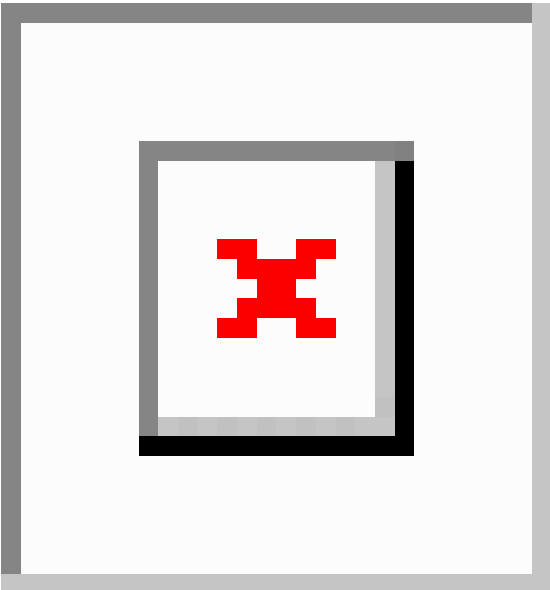
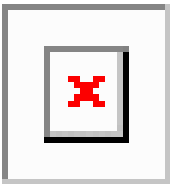
	20GBASE-KR2, 10GBASE-LR,10GBASE-ER, 10GBASE-CX4, 10GBASE-CR, 10GBASE-KR, SGMII, 1000BASE-CX, 1000BASE-KX, 10GBASE-SR					
	Data Rate	Ethernet	1/10/25/40/50/100/200 Gb/s			
	PCI Express Gen 4.0: SERDES @ 16.0GT/s, 16 lanes (2.0 and 1.1 compatible)					
Power and Airflow	Voltage: 3.3VAUX, 12V					
	Power	Cable Type	Active Mode	Standby Mode		
	Typical Power ^(a)	Passive Cables	16.9W	5.6W		
	Maximum Power	Passive Cables	24W	11.4W		
	Maximum power available through QSFP56 port: 5W					
	Airflow	Cable Type	Hot Aisle Heatsink to Port		Cold Aisle Port to Heatsink	
			Active Mode @55C	Standby Mode @45C	Active Mode @35C	Standby Mode @35C
			Passive Cable	500LFM	100LFM	300LFM
	Active 4.55W Cables	750LFM ^(b)	600LFM	300LFM	100LFM	
Environmental	Temperature	Operational	0°C to 55°C			
		Non-operational	-40°C to 70°C			
	Humidity	Operational	10% to 85% relative humidity			
		Non-operational	10% to 90% relative humidity ^(c)			
	Altitude (Operational)	3050m				
Regulatory	Safety	CB / cTUVus / CE				
	EMC	CE / FCC / VCCI / ICES / RCM				

	RoHS	RoHS compliant
a. Typical power for ATIS traffic load. b. At 50 ° C ambient, not 55 ° C. c. The non-operational storage temperature specifications apply to the product without its package.		

Board Mechanical Drawing and Dimensions

Note

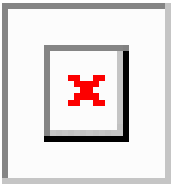
All dimensions are in millimeters. The PCB mechanical tolerance is +/- 0.13mm.

ConnectX-6 Dx SFP28/SFP56 OCP 3.0	ConnectX-6 Dx Dual-Port QSFP56 OCP 3.0	ConnectX-6 Dx Single-Port QSFP56 OCP 3.0
		

Bracket Mechanical Drawings and Dimensions

Note

All dimensions are in millimeters. The bracket's mechanical tolerance is +/- 0.25mm.

Dual-port SFP28/SFP56 Thumbscrew Bracket	Dual-port QSFP56 Thumbscrew Bracket	Single-port QSFP56 Thumbscrew Bracket
		

Monitoring

Thermal Sensors

The adapter card incorporates the ConnectX IC, which operates in the range of temperatures between 0°C and 105°C.

Three thermal threshold definitions impact the overall system operation state:

- **Warning** – 105°C: On managed systems only: When the device crosses the 105°C threshold, a Warning Threshold message is issued by the management SW, indicating to system administration that the card has crossed the warning threshold. Note that this temperature threshold does not require nor lead to any action by hardware (such as adapter card shutdown).
- **Critical** – 115°C: When the device crosses this temperature, the firmware automatically shuts down the device.
- **Emergency** – 130°C: If the firmware fails to shut down the device upon crossing the critical threshold, the device automatically shuts down upon crossing the emergency (130°C) threshold.

The card's thermal sensors can be read through the system's SMBus. The user can read these thermal sensors and adapt the system airflow following the readouts and the needs of the above-mentioned IC thermal requirements.

Adapter Card Heatsink

A heatsink is attached to the ConnectX-6 Dx IC to dissipate the heat. It is connected by four spring-loaded push pins that insert into four mounting holes.

ConnectX®-6 Dx IC has a thermal shutdown safety mechanism that automatically shuts down the ConnectX®-6 Dx card in case of a high-temperature event, improper thermal coupling, or heatsink removal.

For the required airflow (LFM) per OPN, please refer to the [Specifications](#) chapter.

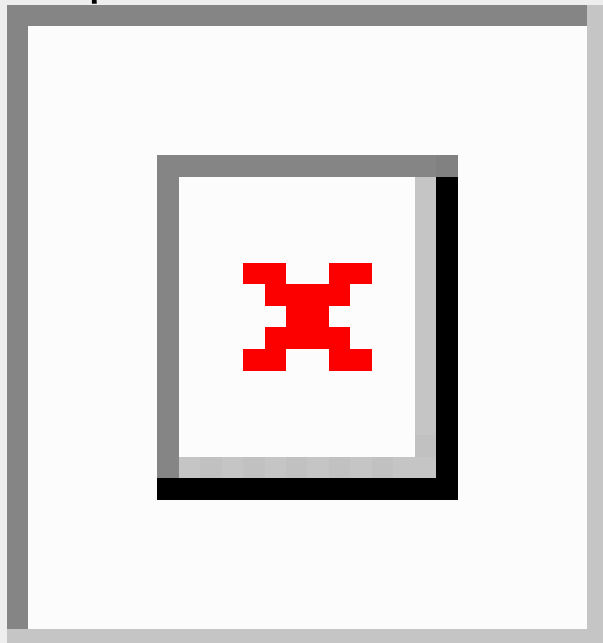
Finding the MAC and Serial Number on the Adapter Card

Each NVIDIA adapter card has a different identifier printed on the label: serial number and the card MAC for the Ethernet protocol.

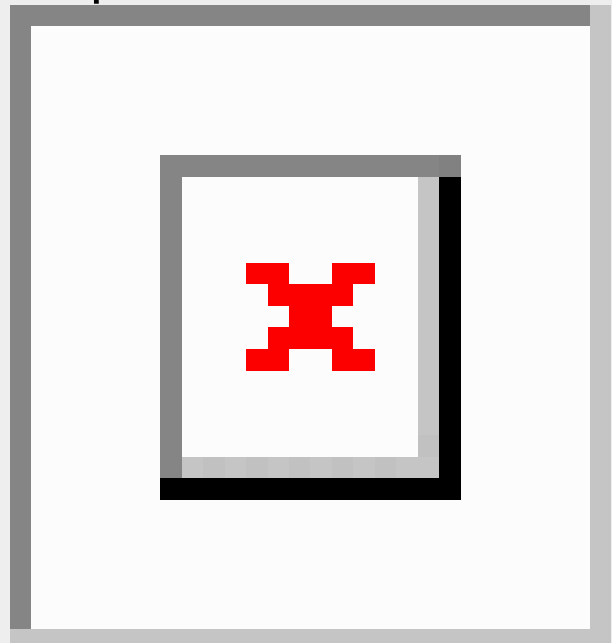
Note

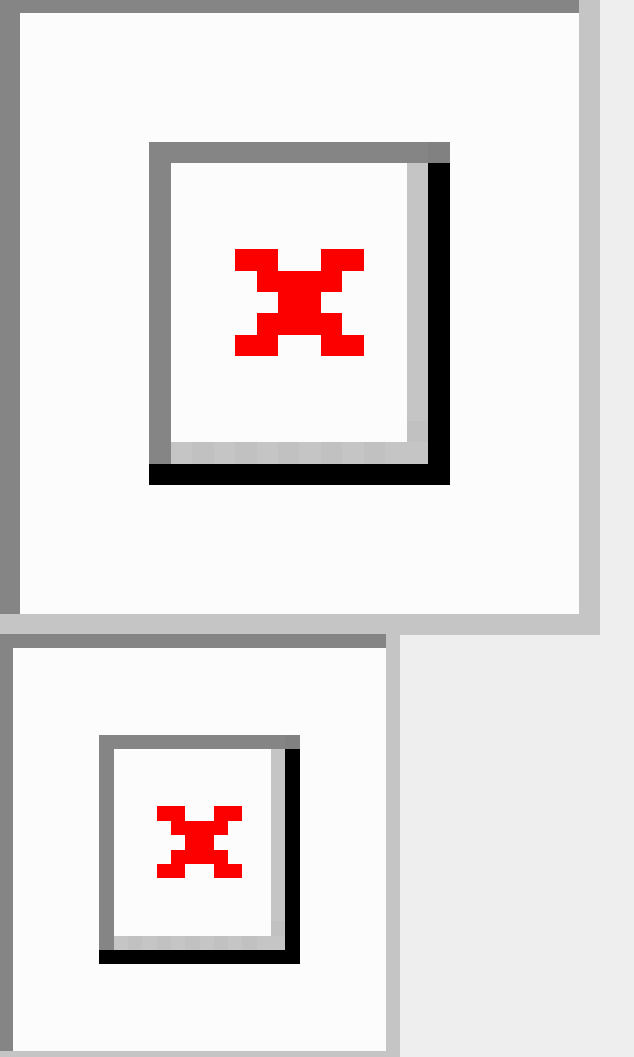
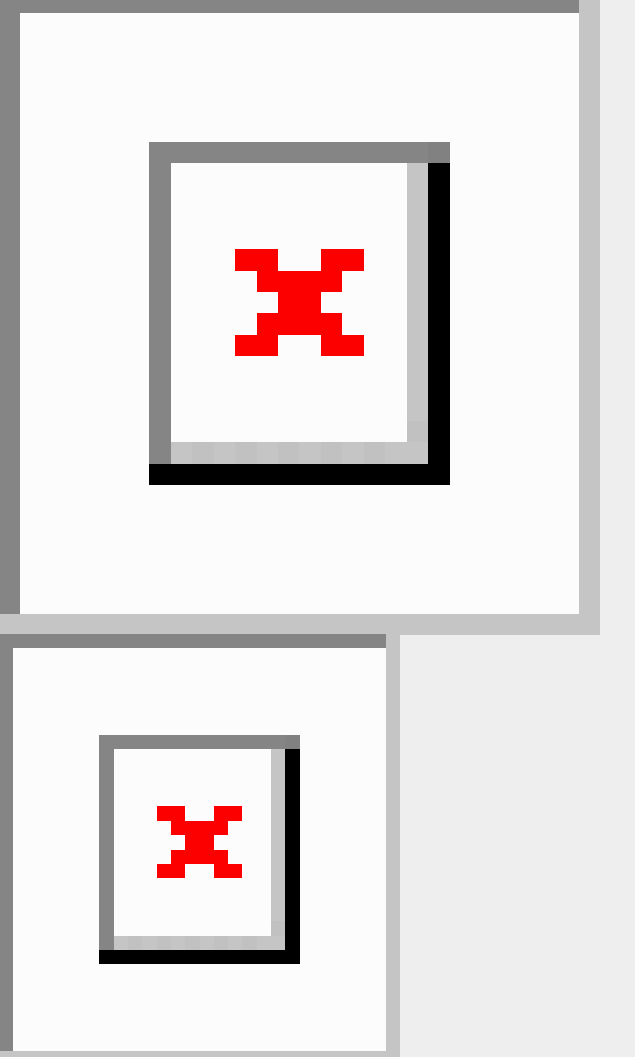
The product revisions indicated on the labels in the following figures do not necessarily represent the latest revisions of the cards.

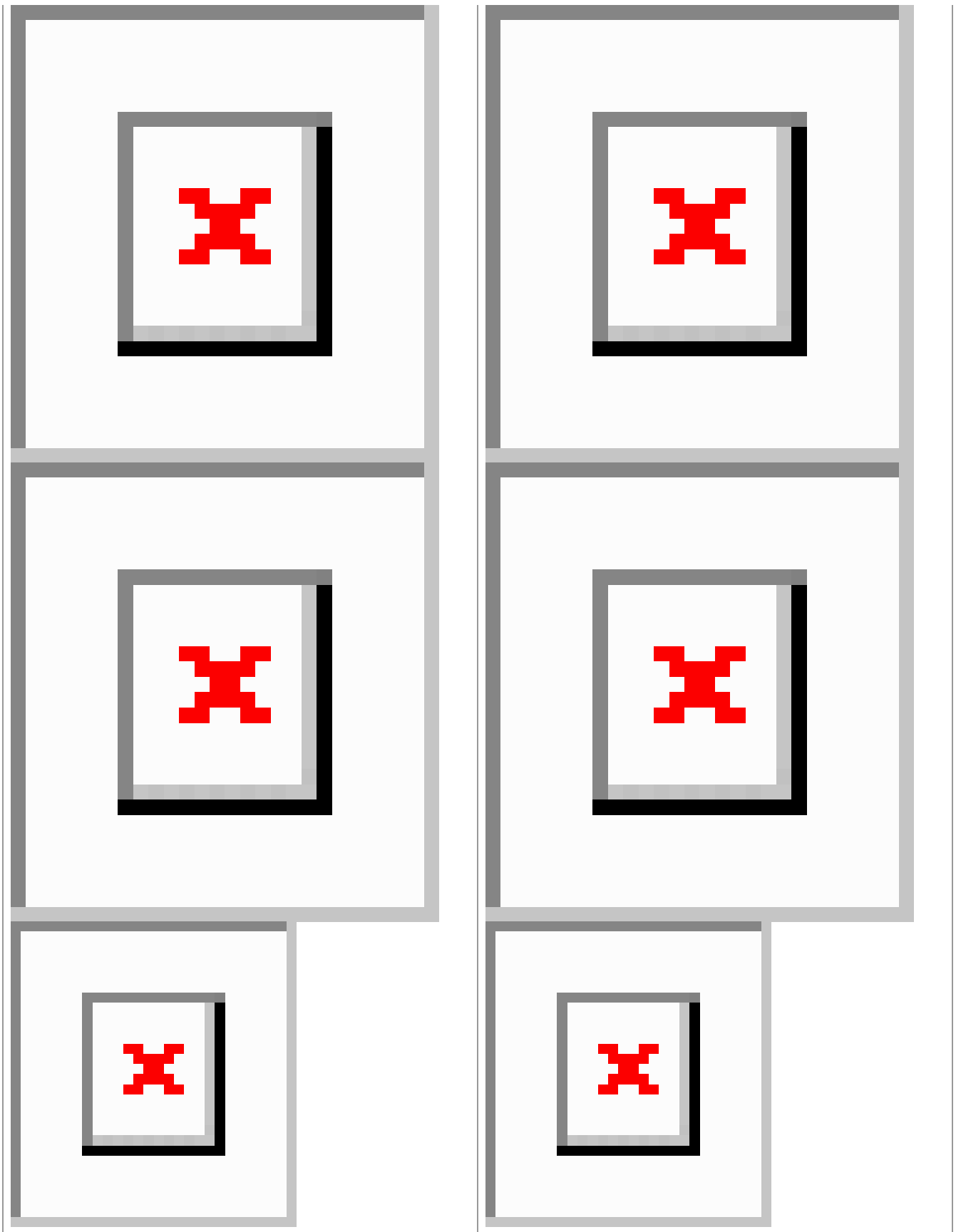
MCX623432AN-ADAB Board Label Example



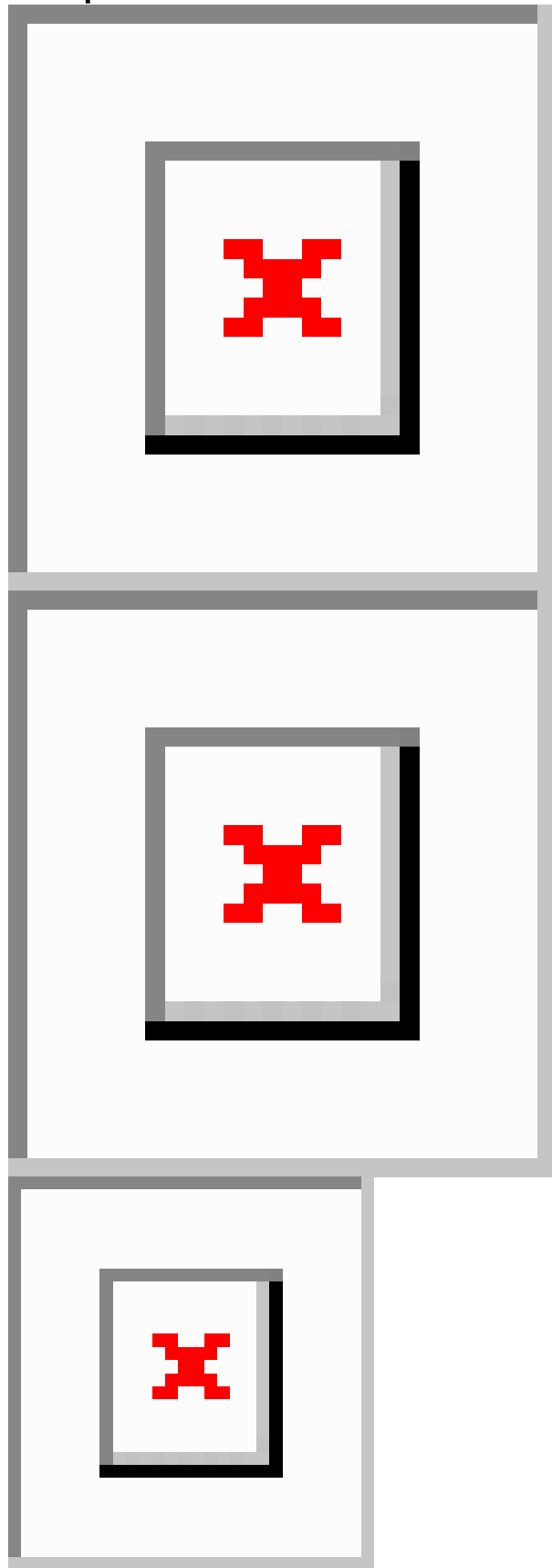
MCX623432AC-ADAB Board Label Example



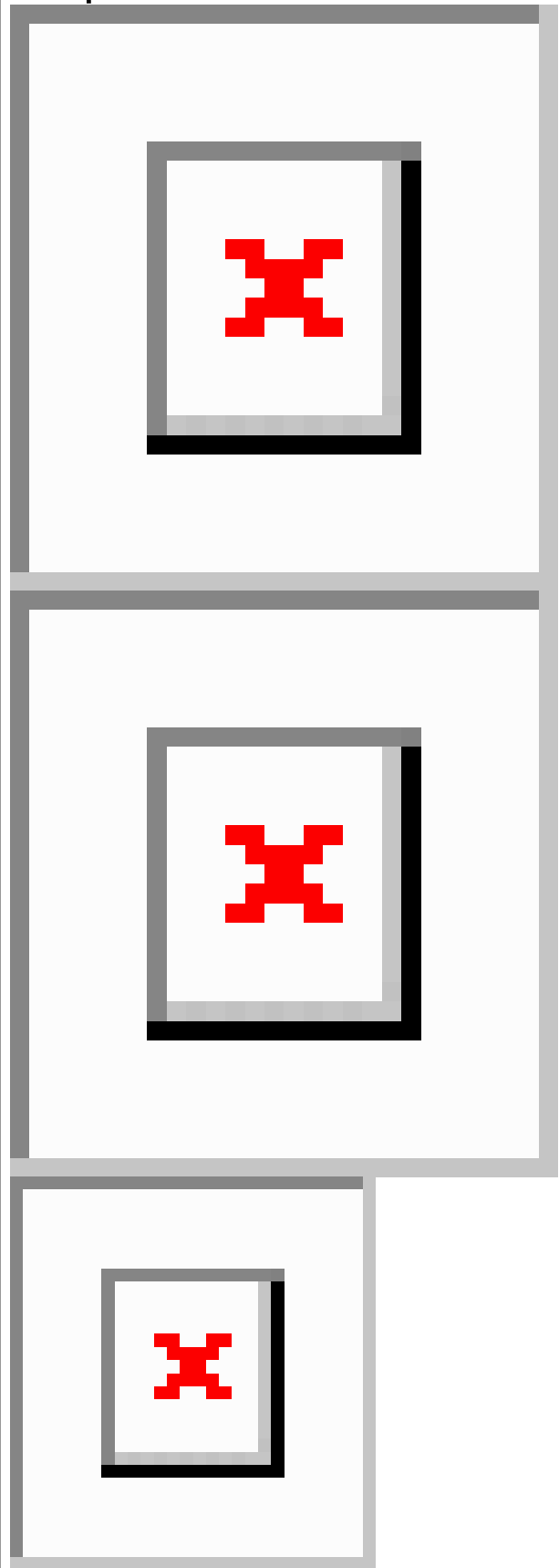
 The diagram shows a board layout with two square labels. Each label consists of a red 'X' inside a square frame. The frame has a thick black border on the right and bottom, and a thinner grey border on the top and left. The labels are positioned in the top-left and bottom-left corners of the board area.	 The diagram shows a board layout with two square labels. Each label consists of a red 'X' inside a square frame. The frame has a thick black border on the right and bottom, and a thinner grey border on the top and left. The labels are positioned in the top-left and bottom-left corners of the board area.
MCX623432AN-GDAB Board Label Example	MCX623432AC-GDAB Board Label Example



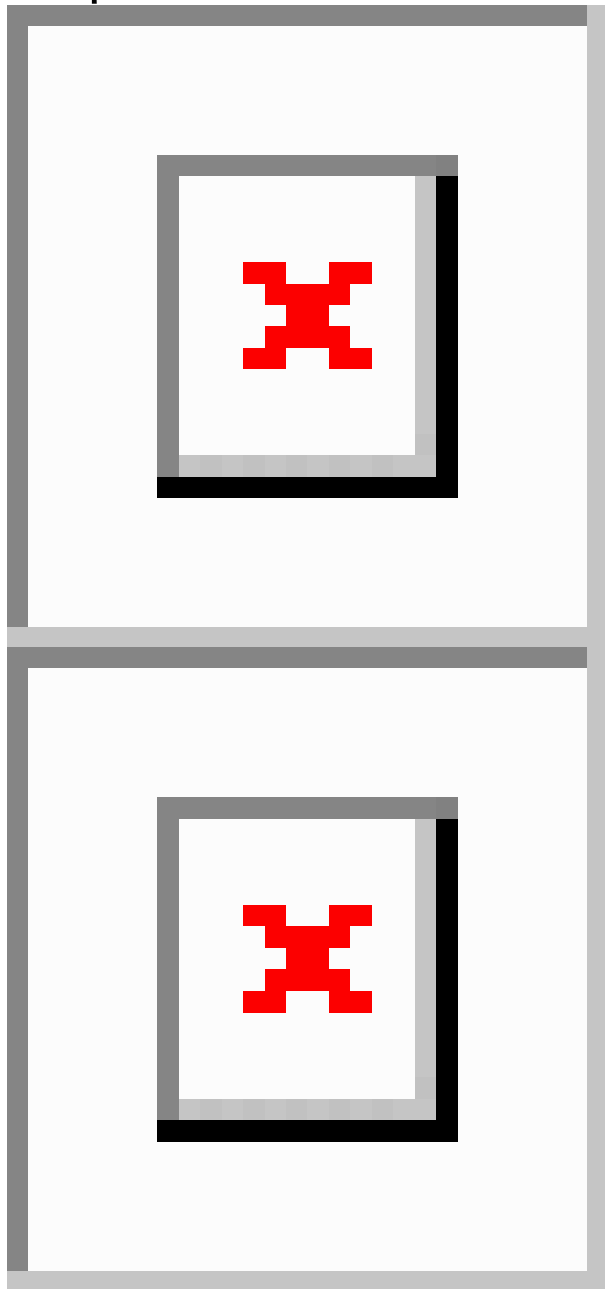
MCX623436AN-CDAB Board Label Example



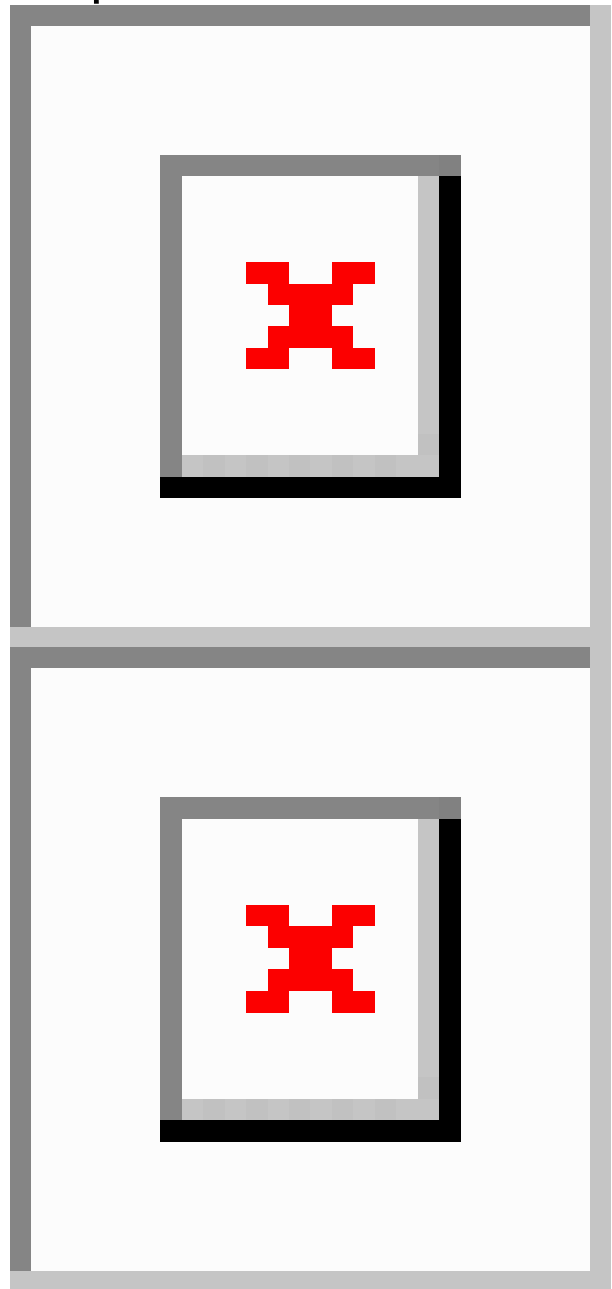
MCX623436AC-CDAB Board Label Example

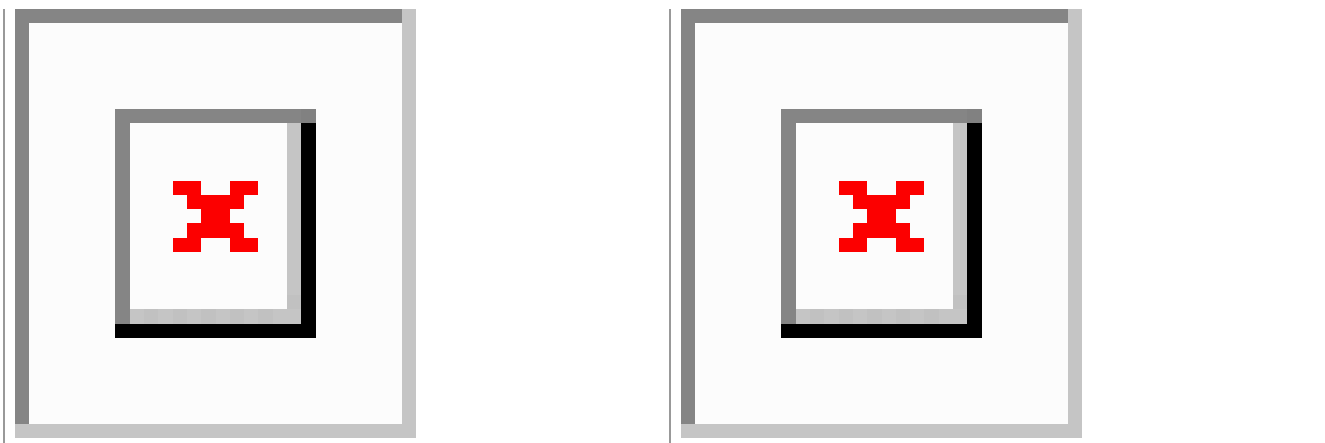


**MCX623435AN-VDAB Board Label
Example**



**MCX623435AC-VDAB Board Label
Example**





Document Revision History

Date	Description of Changes
Jun. 2023	Added important notes on selected OPNs in Ordering Part Numbers and the Specifications chapter
May. 2023	In Specifications : • Updated airflow requirements • Added non-operational storage temperature specifications and updated mechanical drawings
Dec. 2022	Updated Finding the MAC and Serial Number on the Adapter Card
Oct. 2022	Updated Specification tables.
Jul. 2022	Updated brackets' mechanical drawings.
Jun. 2022	Added Multi-Host description in the Introduction and Supported Interfaces.
Mar. 2022	Updated MCX623430MS-CDAB Specifications.
Feb. 2022	Added table Legacy (EOL) Ordering Part Numbers.
Aug. 2021	Added OPN MCX623430MS-CDAB.
Apr. 2021	Added OPNs MCX623436MN-CDAB and MCX623436MS-CDAB.
Mar. 2021	Added OPN MCX623432AS-ADAB.
Feb. 2021	Added OPN MCX623439MC[/N]-CDAB.
Jan. 2021	Added OPNs MCX623435AE-CDAB and MCX623435AN-CDAB
Oct. 2020	• Updated airflow numbers in Specifications.

Date	Description of Changes
	Updated networking ports LEDs indications.
Sep. 2020	Added OCP 3.0 bracket replacement instructions.
Jul. 2020	Updated airflow numbers in Specifications.
Jul. 2020	Updated all power and airflow numbers in Specifications.
Jul. 2020	Added support for MCX623435MN-CDAB.
Feb. 2020	Updated Specifications with power numbers.
Nov. 2019	First release

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