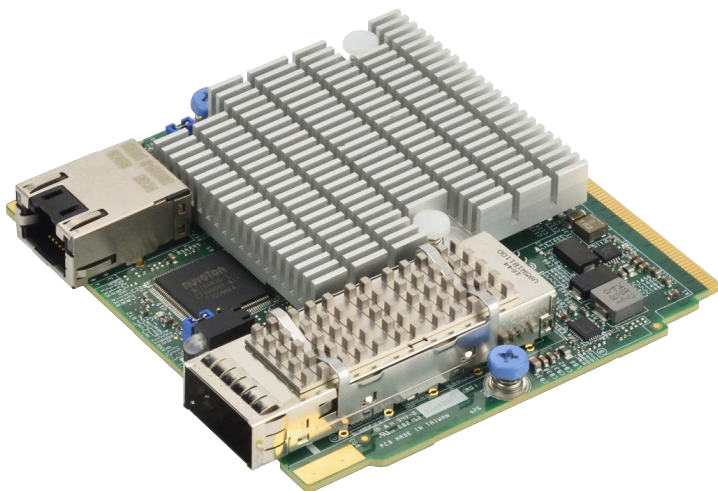




AOC-MHIBE-m1CG



User's Guide

Revision 1.0a

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Preface

About this User's Guide

This user's guide is written for system integrators, PC technicians, and knowledgeable PC users. It provides information for the installation and use of the AOC-MHIBE-m1CG add-on card.

About this Add-on Card

The AOC-MHIBE-m1CG is one of the most powerful InfiniBand controllers in the market. In the SIOM (Super I/O Module) form factor, it provides 100Gbps InfiniBand EDR or 100Gbps Ethernet for the networking bandwidth with additional Gigabit LAN controller for IPMI remote management. Based on Mellanox® ConnectX-4 VPI and Intel® i210, this add-on card provides excellent performance and the most flexible interconnect solution for servers used in data centers and enterprise environments.

An Important Note to the User

All images and layouts shown in this user's guide are based upon the latest PCB revision available at the time of publishing. The card you have received may or may not look exactly the same as the graphics shown in this user's guide.

Returning Merchandise for Service

A receipt or copy of your invoice marked with the date of purchase is required before any warranty service will be rendered. You can obtain service by calling your vendor for a Returned Merchandise Authorization (RMA) number. When returning the add-on-card to the manufacturer, the RMA number should be prominently displayed on the outside of the shipping carton, and the shipping package is mailed prepaid or hand-carried. Shipping and handling charges will be applied for all orders that must be mailed when service is complete. For faster service, You can also request a RMA authorization online (<http://www.supermicro.com>).

This warranty only covers normal consumer use and does not cover damages incurred in shipping or from failure due to the alternation, misuse, abuse or improper maintenance of products.

During the warranty period, contact your distributor first for any product problems.

Conventions Used in the User's Guide

Pay special attention to the following symbols for proper system installation and to prevent damage to the system or injury to yourself:



Note: Additional information given to provide information for correct system setup.

Naming Convention

AOC-MHIBF-m2Q2G

1st
2nd
3rd
5th
6th
7th
8th

Character	Representation	Options
1st	Product Family	AOC: Add On Card
2nd	Form Factor	S: Standard, P: Proprietary, C: MicroLP, M: Super IO Module (SIOM), MH: SIOM Hybrid
3rd	Product Type/Speed	G: GbE (1Gb/s), TG: 10GbE (10Gb/s), 25G: 25GbE (25Gb/s), 40G: 40GbE (40Gb/s), 50G: 50GbE (50Gb/s), 100G: 100GbE (100Gb/s), IBE: EDR IB (100Gb/s), IBF: FDR IB (56Gb/s), IBQ: QDR IB (40Gb/s), HFI: Host Fabric Interface
4th	Chipset Model (Optional)	N: Niantec (82599), P: Powerville (i350), S: Sageville (X550), F: Fortville (XL710/X710), L: Lewisburg (PCH)
5th	Chipset Manufacturer	i: Intel, m: Mellanox, b: Broadcom
6th	Number of Ports	1: 1 port, 2: 2 ports, 4: 4 ports
7th	Connector Type (Optional)	S: SFP+/SFP28, T: 10GBase-T, Q: QSFP+, C: QSFP28
8th	2 nd Controller/Connector Type (Optional)	G: 1x GbE RJ45, 2G: 2x RJ45, S: 1x 10G SFP+, T: 10GBase-T, 2T: 2x 10GBase-T

SMC Networking Add-on Cards

Model	Type	Form Factor	Controller	Connection	Dimension (w/o Brackets) (L x H)	Power (W)
AOC-MGP-I2	GbE	SIOM	Intel® i350 AM2	2 RJ45 (1Gb/port)	3.622" (92mm) x 3.428" (87.68mm)	3.7
AOC-MGP-I4	GbE	SIOM	Intel® i350 AM4	4 RJ45 (1Gb/port)	3.622" (92mm) x 3.428" (87.68mm)	4.4
AOC-MTGN-I2S	10GbE	SIOM	Intel® 82599ES	2 SFP+ (10Gb/port)	3.622" (92mm) x 3.428" (87.68mm)	7.2
AOC-MTG-I4S	10GbE	SIOM	Intel® XL710-BM1	4 SFP+ (10Gb/port)	3.622" (92mm) x 3.428" (87.68mm)	7
AOC-MTG-I2T	10GbE	SIOM	Broadcom® BCM57416	2 RJ45 (10GBase-T)	3.622" (92mm) x 3.428" (87.68mm)	11
AOC-MTG-I2T	10GbE	SIOM	Intel® X550-AT2	2 RJ45 (10GBase-T)	3.622" (92mm) x 3.428" (87.68mm)	13
AOC-MTG-I4T	10GbE	SIOM	2x Intel® X550-AT2	4 RJ45 (10GBase-T)	3.622" (92mm) x 3.428" (87.68mm)	26
AOC-MHIBF-m1Q2G	FDR IB GbE	SIOM	Mellanox® ConnectX-3 Pro Intel® i350	1 QSFP (56Gb/port) 2 RJ45 (1Gb/port)	3.622" (92mm) x 3.428" (87.68mm)	9
AOC-MHIBF-m2Q2G	FDR IB GbE	SIOM	Mellanox® ConnectX-3 Pro Intel® i350	2 QSFP (56Gb/port) 2 RJ45 (1Gb/port)	3.622" (92mm) x 3.428" (87.68mm)	11
AOC-MHIBE-m1CG	EDR IB GbE	SIOM	Mellanox® ConnectX-4 VPI Intel® i210	1 QSFP28 (100Gb/port) 1 RJ45 (1Gb/port)	3.622" (92mm) x 3.428" (87.68mm)	19
AOC-MH25G-I2S2G	25GbE	SIOM	Broadcom® BCM57414 Intel® i350	2 SFP28 (25Gb/port) 2 RJ45 (1Gb/port)	3.622" (92mm) x 3.428" (87.68mm)	9
AOC-MH25G-m2S2T	25GbE	SIOM	Mellanox® ConnectX-4 Lx EN Intel® X550-AT2	2 SFP28 (25Gb/port) 2 RJ45 (10GBase-T)	3.622" (92mm) x 3.428" (87.68mm)	25
AOC-M25G-m4S	25GbE	SIOM	Mellanox® ConnectX-4 Lx EN	4 SFP28 (25Gb/port)	3.622" (92mm) x 3.428" (87.68mm)	20
AOC-M25G-I2S	25GbE	SIOM	Intel® XXV710	2 SFP28 (25Gb/port)	3.622" (92mm) x 3.428" (87.68mm)	11.8
AOC-MHFI-I1C	Omni-Path	SIOM	Intel® OP HFI ASIC (Wolf River WFR-B)	1 QSFP28 (100Gb/port)	3.622" (92mm) x 3.428" (87.68mm)	15

Model	Type	Form Factor	Interface	Controller	Connection	Dimension (w/o Brackets) (L x H)	Power (W)
AOC-SGP-i2	GbE	Standard LP	PCI-E x4	Intel® I350 AM2	2 RJ45 (1Gb/port)	3.9" (99mm) x 2.73" (69mm)	3.5
AOC-SGP-i4	GbE	Standard LP	PCI-E x4	Intel® I350 AM4	4 RJ45 (1Gb/port)	3.9" (99mm) x 2.73" (69mm)	5
AOC-STG-i2T	10GbE	Standard LP	PCI-E x8	Intel® X540-AT2	2 RJ45 (10GbBase-T)	5.9" (150mm) x 2.73" (69mm)	13
AOC-STGS-i1T	10GbE	Standard LP	PCI-E x4	Intel® X550-AT	1 RJ45 (10GbBase-T)	5.9" (150mm) x 2.73" (69mm)	9
AOC-STGS-i2T	10GbE	Standard LP	PCI-E x4	Intel® X550-AT2	2 RJ45 (10GbBase-T)	5.9" (150mm) x 2.73" (69mm)	11
AOC-STG-b2T	10GbE	Standard LP	PCI-E x8	Broadcom® BCM57416	2 RJ45 (10GbBase-T)	5.6" (142mm) x 2.73" (69mm)	13.1
AOC-STG-i4T	10GbE	Standard LP	PCI-E x8	Intel® XL710-BM1	4 RJ45 (10GbBase-T)	5.9" (149mm) x 2.73" (69mm)	15.5
AOC-STGN-i1S	10GbE	Standard LP	PCI-E x8	Intel® 82598EN	1 SFP+ (10Gb/port)	4.0" (102mm) x 2.73" (69mm)	10
AOC-STGN-i2S	10GbE	Standard LP	PCI-E x8	Intel® 82598ES	2 SFP+ (10Gb/port)	4.0" (102mm) x 2.73" (69mm)	11.2
AOC-STGF-i2S	10GbE	Standard LP	PCI-E x8	Intel® X710-BM2	2 SFP+ (10Gb/port)	5.19" (132mm) x 2.73" (69mm)	5.6
AOC-STG-b4S	10GbE	Standard LP	PCI-E x8	Broadcom® BCM57840S	4 SFP+ (10Gb/port)	5.4" (137mm) x 2.73" (69mm)	14
AOC-STG-i4S	10GbE	Standard LP	PCI-E x8	Intel® XL710-BM1	4 SFP+ (10Gb/port)	5.9" (150mm) x 2.73" (69mm)	8
AOC-S25G-m2S	25GbE	Standard LP	PCI-E x8	Mellanox® CX-4 LX	2 SFP28 (25Gb/port)	5.6" (142mm) x 2.713" (69mm)	8.7
AOC-S25G-b2S	25GbE	Standard LP	PCI-E x8	Broadcom® BCM57414	2 SFP28 (25Gb/port)	5.6" (142mm) x 2.713" (69mm)	5.2
AOC-S25G-i2S	25GbE	Standard LP	PCI-E x8	Intel® XXV710	2 SFP28 (25Gb/port)	6.1" (155mm) x 2.713" (69mm)	7.2
AOC-S40G-i1Q	40GbE	Standard LP	PCI-E x8	Intel® XL710-BM1	1 QSFP+ (40Gb/port)	5.9" (150mm) x 2.73" (69mm)	6.5
AOC-S40G-i2Q	40GbE	Standard LP	PCI-E x8	Intel® XL710-BM2	2 QSFP+ (40Gb/port)	5.9" (150mm) x 2.73" (69mm)	7
AOC-S100G-m2C	100GbE	Standard LP	PCI-E x16	Mellanox® CX-4 EN	2 QSFP28 (100Gb/port)	6.6" (168mm) x 2.73" (69mm)	16.3
AOC-CGP-i2	GbE	MicroLP	PCI-E x4	Intel® I350 AM2	2 RJ45 (1Gb/port)	4.45" (113mm) x 1.54" (39mm)	4
AOC-CTG-i1S	10GbE	MicroLP	PCI-E x8	Intel® 82598EN	1 SFP+ (10Gb/port)	4.85" (123mm) x 1.54" (39mm)	10
AOC-CTG-i2S	10GbE	MicroLP	PCI-E x8	Intel® 82598ES	2 SFP+ (10Gb/port)	4.85" (123mm) x 1.54" (39mm)	11
AOC-CTG-i2T	10GbE	MicroLP	PCI-E x8	Intel® X540-AT2	2 RJ45 (10GbBase-T)	4.8" (123mm) x 2.76" (71mm)	13
AOC-CTGS-i2T	10GbE	MicroLP	PCI-E x4	Intel® X550-AT2	2 RJ45 (10GbBase-T)	4.45" (113mm) x 1.54" (39mm)	12
AOC-C25G-m1S	25GbE	MicroLP	PCI-E x8	Mellanox® CX-4 Lx EN	1 SFP28 (25Gb/port)	4.45" (113mm) x 1.54" (39mm)	8.5

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Chapter 1


Overview

1-1 Overview

Congratulations on purchasing your add-on card from an acknowledged leader in the industry. Supermicro products are designed with the utmost attention to detail to provide you with the highest standards in quality and performance. For product support and updates, please refer to our website at <http://www.supermicro.com/products/nfo/networking.cfm#adapter>.

1-2 Key Features

The key features of this add-on card include the following:

- Super I/O Module (SIOM) form factor
- Mellanox® ConnectX-4 VPI InfiniBand EDR controller, single QSFP28 connector
- Up to 100Gbps InfiniBand or 100Gbps Ethernet
- Virtual Protocol Interconnect (VPI)
- VXLAN and NVGRE
- Intel® i210 GbE controller, single RJ45 connector
- SR-IOV for virtualization
- NC-SI for remote management
- Asset Management with thermal sensor
- RoHS compliant 6/6 

1-3 Specifications

General

- Super I/O Module (SIOM) form factor

- Mellanox® ConnectX-4 VPI EDR controller
 - Single QSFP28 port with speeds up to 100Gbps per port
- Intel® i210 GbE controller
 - Single RJ45 port with speeds up to 1Gbps per port

Cables Support

- InfiniBand EDR/100GbE:
 - QSFP28 100Gbps copper cable
 - Fiber optic cable (with required optional QSFP28 optical transceiver)
- GbE: RJ45 category 5/5e up to 100m



Note: Please check Supermicro website for supported cable/transceiver part numbers.

Power Consumption

- Maximum 19W

Operating Condition

- Operating temperature: 0°C to 55°C (32°F to 131°F)
- Storage temperature: -40°C to 70°C (-40°F to 158°F)
- Storage humidity: 90% non-condensing relative humidity at 35°C

Physical Dimensions

- Card PCB dimensions: 92mm (3.62in) x 87.1mm (3.43in) (WxD)

Supported Platforms

- Supermicro® motherboards with Super I/O Module (SIOM) slot

- Supermicro® server systems with Super I/O Module slot (see SIOM Compatibility Matrix online at http://www.supermicro.com/support/resources/AOC/AOC_Compatibility_SIOM.cfm)

1-4 InfiniBand EDR QSFP28 Specifications

Mellanox® ConnectX-4 VPI EDR controller with a single QSFP28 port and speeds up to 100Gbps.

InfiniBand

- IBTA specification 1.3 compliant
- Hardware-based congestion control
- 256 to 4Kbyte MTU, 2GB messages

Enhanced Features

- Hardware-based reliable transport
- Collective operations offloads
- Mellanox PeerDirect™ RDMA communication acceleration
- Extended reliable connected transport
- Enhanced atomic operations

Ethernet

- IEEE 802.3bj, 802.3bm 100 Gigabit Ethernet
- IEEE 802.3az Energy Efficient Ethernet
- IEEE 802.3ad, 802.1AX Link Aggregation
- IEEE 1588v2
- Jumbo frame support (9.6KB)

Overlay Networks

- Hardware offload of encapsulation and decapsulation of NVGRE and VXLAN overlay networks

Hardware-based I/O Virtualization

- Single root IOV
- Multi-function per port
- Address translation and protection
- Multiple queues per virtual machine
- Enhanced QoS for vNICs
- VMware NetQueue support

Virtualization

- SR-IOV: Up to 256 virtual functions
- SR-IOV: Up to 16 physical functions per port

CPU Offloads

- RDMA over Converged Ethernet (RoCE)
- TCP/UDP/IP stateless offload
- LSO, LRO, checksum offload
- Intelligent interrupt coalescence

Remote Boot

- Remote boot over InfiniBand
- Remote boot over Ethernet

- Remote boot over iSCSI
- PXE and UEFI

Protocol Support

- OpenMPI, IBM PE, OSU MPI (MVAPICH/2), Intel® MPI
- Platform MPI, UPC, Mellanox SHMEM
- TCP/UDP, EoIB, IPoIB, SDP, RDS, MPLS, VxLAN, NVGRE, GENEVE
- SRP, iSER, NFS RDMA, SMB Direct
- uDAPL

Operating System Support

- Linux
- Windows
- FreeBSD
- VMware

1-5 GbE RJ45 Specifications

Intel® i210 GbE controller with a single RJ45 port and speeds up to 1Gbps

Performance and Efficiency Features

- Energy Efficient Ethernet (EEE)
- Jumbo frame support
- Low latency
- TCP/UDP, IPv4 checksum offloads

- IPv6 support for IP/TCP and IP/UDP receive checksum offload
- Low latency interrupts

Manageability Features

- NC-SI

Operating System Support

- Linux
- Windows
- FreeBSD
- VMware



Note: This product is sold only as part of an integrated solution with Supermicro server systems.

1-6 Available SKUs

SKUs	Bracket Included	Description
AOC-MHIBE-m1CG	BKT-0142L	Single-port InfiniBand EDR Adapter with a swappable bracket for 2U+ chassis (Storage Servers)
AOC-MHIBE-m1CGM	BKT-0141L	Single-port InfiniBand EDR Adapter with an internal bracket for 1U chassis (Twin Servers)

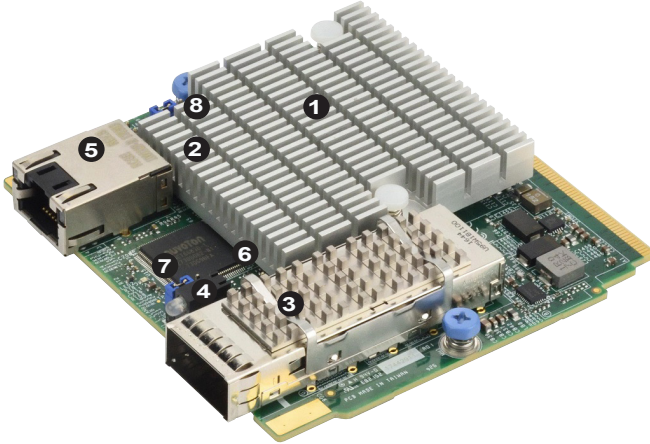
1-7 Similar Products

Model	Form Factor	Speed	Connector Type	Total Ports	Controller
AOC-MGP-i2	SIOM	GbE	RJ45	2	Intel® i350
AOC-MGP-i4	SIOM	GbE	RJ45	4	Intel® i350
AOC-MTGN-i2S	SIOM	10GbE	SFP+	2	Intel® 82599ES
AOC-MTG-i4S	SIOM	10GbE	SFP+	4	Intel® XL710-BM1
AOC-MTG-i2T	SIOM	10GbE	RJ45	2	Intel® X550
AOC-MTG-i4T	SIOM	10GbE	RJ45	4	Intel® X550
AOC-MTG-b2T	SIOM	10GbE	RJ45	2	Broadcom® BCM57416
AOC-MH25G-m2S2T	SIOM	25GbE 10GbE	SFP28 RJ45	2 2	Mellanox® CX-4 Lx EN Intel® X550
AOC-MH25G-b2S2G	SIOM	25GbE 1GbE	SFP28 RJ45	2 2	Broadcom® BCM57414 Intel® i350
AOC-M25G-i2S	SIOM	25GbE	SFP28	2	Intel® XXV710
AOC-M25G-m4S	SIOM	25GbE	SFP28	4	Mellanox® CX-4 Lx EN
AOC-MHIBF-m2Q2G	SIOM	FDR IB GbE	QSFP+ RJ45	2 2	Mellanox® CX-3 Pro Intel® i350
AOC-MHIBF-m1Q2G	SIOM	FDR IB GbE	QSFP+ RJ45	1 2	Mellanox® CX-3 Pro Intel® i350
AOC-MHFI-i1C	SIOM	Omni-Path	QSFP28	1	Intel® OP HFI ASIC (Wolf River WFR-B)

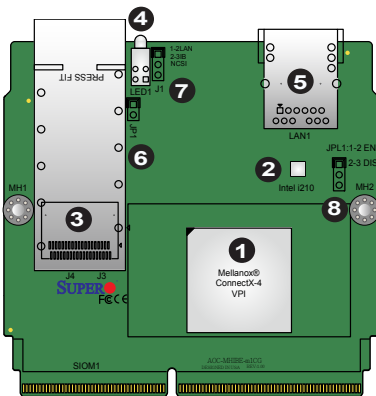
Chapter 2

Hardware Components

2-1 Add-On Card Image and Layout



The AOC-MHIBE-m1CG Image



The AOC-MHIBE-m1CG Layout

1. Mellanox® ConnectX-4 VPI	5. LAN1: RJ45 Port1
2. Intel® i210	6. Jumper JP1: Fix Address for Nuvoton
3. QSFP1: QSFP28 Port1	7. Jumper J1: NC-SI LAN/IB Port select
4. LED1: QSFP28 Port1 LED	8. Jumper JPL1: RJ45 LAN Port Enable/Disable

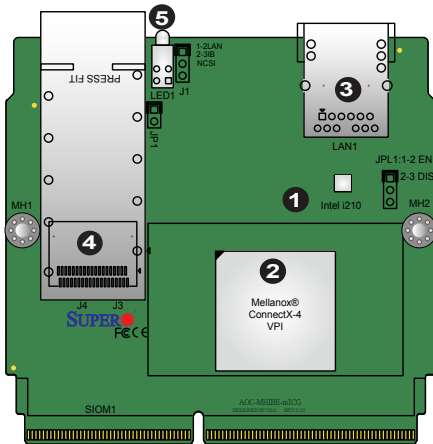
2-2 Jumpers and Major Components

The table below contains jumpers on the AOC-MHIBE-m1CG:

Jumper	Description	Default Setting
JP1	Fix address for Nuvoton firmware burn-in	Not installed
J1	NC-SI LAN/IB Port Select	1-2 LAN
JPL1	RJ45 LAN Port Enable/Disable	1-2 Enable

The following major components are installed on the AOC-MHIBE-m1CG:

1. Intel® i210
2. Mellanox® ConnectX-4 VPI
3. Single RJ45 LAN port
4. Single QSFP28 (Small Form Factor Pluggable) port
5. QSFP28 Link/Activity LED



2-3 QSFP28 Ethernet Connections

QSFP28 (QSFP1) Connector

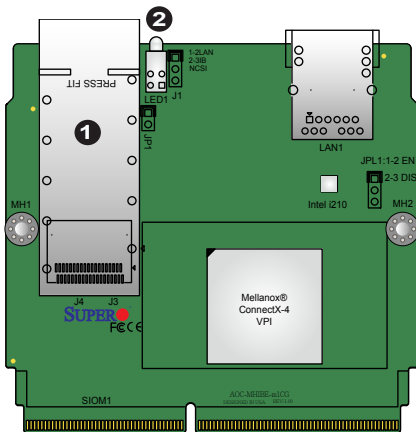
One small form-factor pluggable (QSFP28) optical transceiver connector (QSFP1) is located on the add-on card. Connect a QSFP28 cable to this port to provide Infiniband (100Gb/s) and Ethernet (100GbE) communication. See the layout below for the location.

QSFP28 (QSFP1) Link/Activity LED Indicators

One Link/Activity LED indicator is located at LED1 on the add-on card. LED1 is used for the QSFP28 (QSFP1) connector. See the tables below for the LED color and definition.

Port Activity LED	
LED Color	Port Assigned
Yellow	Active

Port Link LED	
LED Color	Definition
Green	Link Established



1. QSFP Connector
2. QSFP Link/Activity LED Indicator

2-4 RJ45 LAN Port and LAN LED indicator

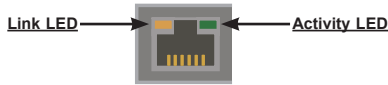
RJ45 LAN Port (LAN1)

There is one RJ45 LAN port (LAN1) on the AOC-MHIBE-m1CG. The LAN port supports connection speed of 1Gbps. Use a direct-attach RJ45 type LAN cable. See the layout below for the location.

 **Note:** Please refer to page 1-2 for recommended cables.

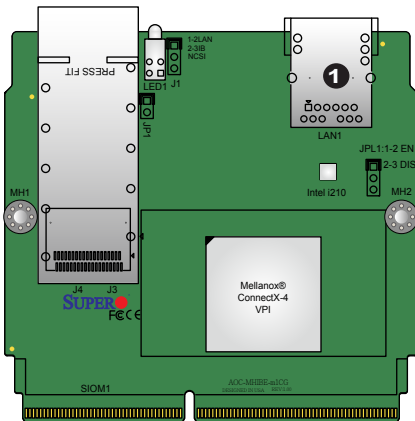
RJ45 LAN Port LED Indicators

The LAN port has two LEDs to indicate speeds and data activities. Refer to the tables below for LED color and definition.



RJ45 LAN Port Link LED (Left) LED State	
LED Color	Definition
Off	No Link
Amber	1 Gbps
Green	100 Mbp

RJ45 LAN Port Activity LED (Right) LED State		
LED Color	Status	Definition
Off	Off	No Connection
Green	Solid	Link
Green	Flashing	Active



1. RJ45 LAN Port

Chapter 3

Installation

3-1 Static-Sensitive Devices

Electrostatic Discharge (ESD) can damage electronic components. To avoid damaging your add-on card, it is important to handle it very carefully. The following measures are generally sufficient to protect your equipment from ESD.

Precautions

- Use a grounded wrist strap designed to prevent static discharge.
- Touch a grounded metal object before removing the add-on card from the antistatic bag.
- Handle the add-on card by its edges only; do not touch its components.
- Put the add-on card back into the antistatic bags when not in use.
- For grounding purposes, make sure that your system chassis provides excellent conductivity between the power supply, the case, the mounting fasteners and the add-on card.

Unpacking

The add-on card is shipped in antistatic packaging to avoid static damage. When unpacking your component or system, make sure you are static protected.



Note: To avoid damaging your components and to ensure proper installation, always connect the power cord last, and always unplug it before adding, removing, or changing any hardware components.

3-2 Before Installation

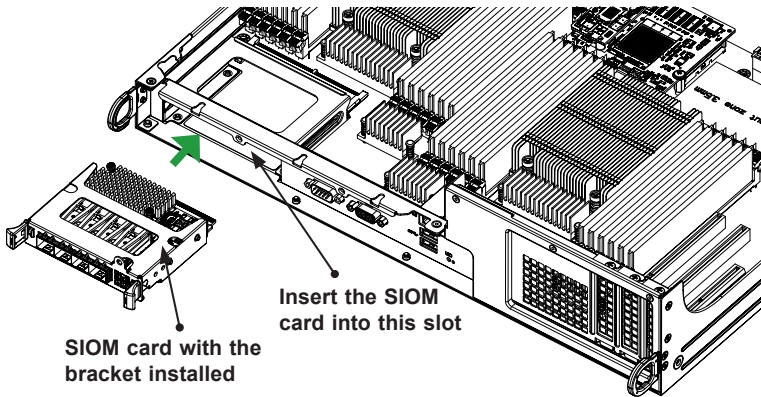
Before you install the add-on card, follow the instructions below.


1. Power down the system.
2. Unplug the power cord.
3. Use industry-standard anti-static equipment such as gloves or a wrist strap and follow the precautions on page 3-1 to avoid damage caused by ESD.
4. Familiarize yourself with the server, motherboard, and/or chassis documentation.
5. Confirm that your operating system includes the latest updates and hotfixes.

3-3 Installing the Add-on Card

Follow the steps below to install the add-on card into your system.

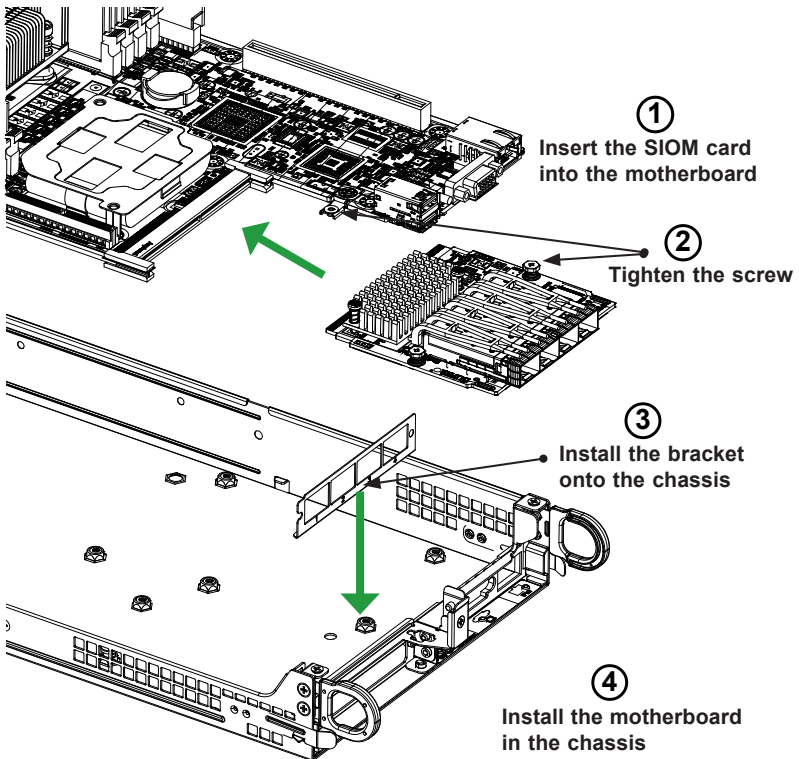
1. Remove the server cover and, if any, set aside any screws for later use.
2. Remove the add-on card slot cover. If the slot cover has a screw, place it aside for later use.
3. Position the add-on card in front of the SIOM slot and gently push in both sides of the card until it slides into the slot.




 **Note:** This add-on card does not support hot plug. Please turn off the AC power and remove the power cord from the wall socket before you install or remove the add-on card.

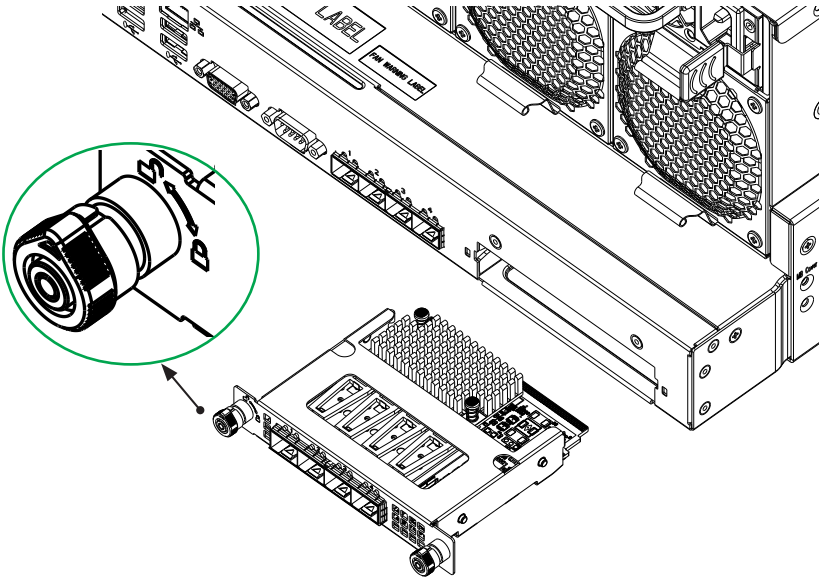
4. Secure the add-on card to the chassis. If required, use the screws that you previously removed.
5. Attach any necessary external cables to the add-on card.
6. Replace the system cover.
7. Plug in the power cord and power up the system.

Follow this step to install the add-on card if your system does not support a swappable bracket. Insert the SIOM card in the motherboard and then install the motherboard in the chassis. An internal bracket comes with the SIOM card 1U in the chassis SKU. It needs to be installed onto the chassis.



 **Note:** Supermicro recommends that this SIOM card be installed by a system integrator or by the manufacturer.

Follow the steps below to install the add-on card into your system that supports a swappable bracket. The add-on card must be installed in the swappable bracket before it can be installed in your system

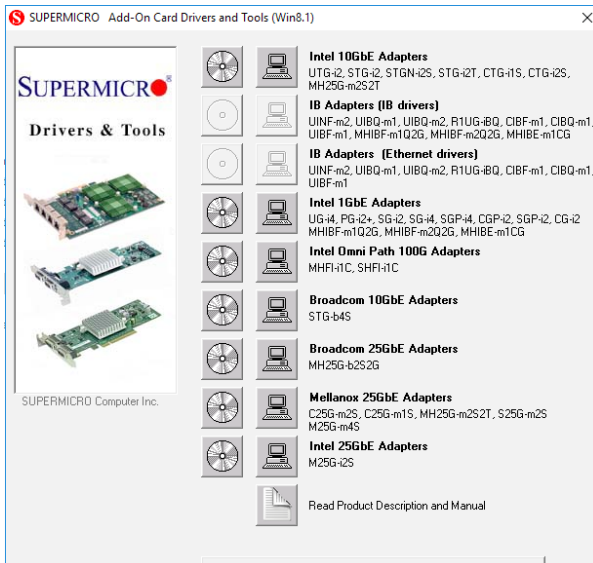


1. Install the add-on card into the swappable bracket.
2. Position the add-on card in front of the SIOM slot and gently push in both sides of the card until it slides into the slot.
3. Once the card is in the slot, push both knobs in and turn to the right to lock the card in the system. The left knob has the unlock/lock symbols next to it. To ensure that the add-on is locked, make sure that the knob position indicator is pointing to the lock symbol.

3-4 Installing Drivers on Windows (for Intel® i210)

Follow the steps below to install the drivers for the Windows operation systems. Download the driver from the Supermicro CDR-NIC LAN driver CD, the Intel® Support website that contains the latest driver, or go to the Supermicro site at https://www.supermicro.com/wftp/Networking_Drivers/.

1. Run CDR-NIC.
2. When the SUPERMICRO window appears, click on the computer icon next to the product model.



3-5 Installing Drivers on Linux (for Intel® i210)

Follow the steps below to install the drivers for Linux.

Build a Binary RPM Package

1. Run `rpmbuild -tb <filename.tar.gz>`
2. Replace `<filename.tar.gz>` with the specific filename of the driver.



Note: For the build to work properly, the current running kernel MUST match the version and configuration of the installed kernel sources. If you have just recompiled the kernel, reboot the system at this time. Follow the instructions below to build the driver manually.

Follow the instructions below to build the driver manually.

1. Move the base driver tar file to the directory of your choice. For example:

```
/home/username/igb
```

or

```
/usr/local/src/igb
```

2. Untar/unzip archive, where <x.x.x> is the version number for the driver tar file:

```
tar xvzf igb-x.x.x.tar.gz
```

3. Change to the driver src directory, where <x.x.x> is the version number for the driver tar:

```
cd igb-x.x.x/src/
```

4. Compile the driver module:

```
make install
```

The binary will be installed as:

```
/lib/modules/[KERNEL_VERSION]/kernel/drivers/net/ethernet/  
intel/ixgbe/ixgbe.ko.xz
```

The install locations listed above are the default locations. They may not be correct for certain Linux distributions. For more information, see the `ldistrib.txt` file included in the driver tar.



Note: `IXGBE_NO_LRO` is a compile time flag. The user can enable it at the compile time to remove support for LRO from the driver. The flag is used by adding `CFLAGS_EXTRA="-DIXGBE_NO_LRO"` to the make file when it's being compiled.

```
make CFLAGS_EXTRA="-DIXGBE_NO_LRO" install
```

5. Load the module:

For kernel 2.6.x, use the `modprobe` command:

```
modprobe ixgbe <parameter>=<value>
```


For 2.6 kernels, the *insmod* command can be used if the full path to the driver module is specified. For example:

```
insmod /lib/modules/[KERNEL_VERSION]/kernel/drivers/net/  
ethernet/intel/ixgbe/ixgbe.ko.xz
```

For more driver installation information, please refer to the Intel® Support website.

3-6 Installing Drivers on FreeBSD (for Intel® i210)

Follow the instructions below to install the drivers for FreeBSD kernel 4.8 or later. In the instructions below, x.x.x is the driver version as indicated in the name of the drive tar file.



Note: You must have kernel sources installed in order to compile the driver module.

1. Move the base driver tar file to the directory of your choice. For example, use

```
/home/username/ixgb or /usr/local/src/ixgb.
```

2. Untar/unzip the archive:

```
tar xfz ixgb-x.x.x directory
```

3. To install main page:

```
cd ixgb-x.x.x  
gzip -c ixgb.4 > /usr/share/man/man4/ixgb.4.gz
```

4. To load the driver onto a running system, perform the following steps:

```
cd ixgb-x.x.x  
make  
or  
cd ixgb-x.x.x/src  
make load
```

5. To assign an IP address to the interface, enter the following:

```
ifconfig ixgb<interface_num> <IP_address>
```

6. Verify that the interface works. Enter the following, where <IP_address> is the IP address for another machine on the same subnet as the interface that is being tested:

```
ping <IP_address>
```

7. If you want the driver to load automatically when the system is booted:

```
cd ixgb-x.x.x/src
make load
cp if_ixgb.ko /modules
```

Edit `/boot/loader.conf`, and add the following line:

```
if_ixgb_load="YES"

or
```

compile the driver into the kernel (see item 8 below). Edit `/etc/rc.conf`, and create the appropriate `ifconfig_ixgb<interface_num>` entry:

```
ifconfig_ixgb<interface_num>="<ifconfig_settings>"
```

Example of usage:

```
ifconfig_ixgb0="inet 192.168.10.1 netmask 255.255.255.0"
```

8. If you want to compile the driver into the kernel, enter:

```
cd ixgb-x.x.x/src
mkdir /usr/src/sys/dev/ixgb
cp if_ixgb* /usr/src/sys/dev/ixgb
cp ixgb* /usr/src/sys/dev/ixgb
cp Makefile.kernel /usr/src/sys/modules/ixgb/Makefile
```

Edit the `/usr/src/sys/conf/files.i386` file, and add the following lines:

```
dev/ixgb/ixgb_hw.c optional ixgb
dev/ixgb/ixgb_ee.c optional ixgb
dev/ixgb/if_ixgb.c optional ixgb
```

Remove the following lines from the `/usr/src/sys/conf/files.i386` file, if they exist:

```
/dev/ixgb/if_ixgb_fx_hw.c optional ixgb
/dev/ixgb/if_ixgb_phy.c optional ixgb
```

Edit the kernel configuration file (i.e., `GENERIC` or `MYKERNEL`) in `/usr/src/sys/i386/conf`, and ensure the following line is present:

```
device ixgb
```

Compile and install the kernel. Reboot the system for the kernel updates to take affect.

3-7 Installing Drivers (for Mellanox® ConnectX®-4 VPI)

Use the procedures below to install drivers for Linux.

Linux Drivers

Use the following procedures to install drivers on the Linux operating system.

Installing InfiniBand Drivers for the Linux Operating System

1. Download the driver from the Supermicro CDR-NIC LAN driver CD, the Mellanox® Support website that contains the latest driver, or go to the Supermicro site at https://www.supermicro.com/wftp/Networking_Drivers/Mellanox/. Go to the following directory: Mellanox > Linux.
2. Choose the desired InfiniBand Linux driver package file.
3. Install the driver by entering the following commands:

```
tar xzvf MLNX_OFED_LINUX-<ver>.tgz
cd MLNX_OFED_LINUX-<ver>
./mlnxofedinstall --without-fw-update
```

This installs the Linux driver to your system. For more driver installation information, please refer to the Mellanox® Support website.

Windows Drivers

Use the following procedures to install drivers on the Windows operating system.

Installing InfiniBand Drivers for the Windows Operating System

1. Download the driver from the Supermicro CDR-NIC LAN driver CD, the Mellanox® Support website that contains the latest driver, or go to the Supermicro site at https://www.supermicro.com/wftp/Networking_Drivers/Mellanox/. Go to the following directory: Mellanox > Windows.
2. Choose the desired InfiniBand Windows driver package file.
3. Double-click to run and install the driver package file.

3-8 Changing from InfiniBand to Ethernet mode

AOC-MHIBE-m1CG is by default set to InfiniBand mode. To change the setting to Ethernet mode, please follow the instructions below.

1. Double-check and make sure that the add-on card is detected. Run the *lspci* command:

```
[root@localhost ~]# lspci | grep Mellanox
17:00.0 Ethernet controller: Mellanox Technologies
MT27700 Family [ConnectX-4]
```

2. If the setting remains unchanged, start MST:

```
[root@localhost ~]# mst start
Starting MST (Mellanox Software Tools) driver set
Loading MST PCI module - Success
[warn] mst_pciconf is already loaded, skipping
Create devices
Unloading MST PCI module (unused) - Success
```

3. To check whether the add-on card is set to Ethernet or InfiniBand mode and to verify if the LAN port is active or not, run the following command:

ibv_devinfo

```
[root@localhost ~]# ibv_devinfo
hca_id: mlx5_0
    transport:                InfiniBand (0)
    fw_ver:                   12.21.1000
    node_guid:                 ac1f:6bff:ff0d:a004
    sys_image_guid:           ac1f:6bff:ff0d:a004
    vendor_id:                 0x02c9
    vendor_part_id:           4115
    hw_ver:                   0x0
    board_id:                  SM_1221000001000
    phys_port_cnt:            1
    Device ports:
        port:                  1
                                state:                PORT_DOWN (1)
                                max_mtu:                4096 (5)
                                active_mtu:              4096 (5)
                                sm_lid:                  0
                                port_lid:                65535
                                port_lmc:                0x00
                                link_layer:              InfiniBand
```

4. Use the command, **#mlxfwmanager**, to extract the "vendor_part id" parameter.

```
[root@localhost ~]# mlxfwmanager
Querying Mellanox devices firmware...
Device#1:
- - - - -
Device Type:    ConnectX4
Part Number:    Super_Micro_AOC-MHIBE-M1CG_R100
Description:    Super Micro ConnectX-4 Single Port VPI
EDR/100GbE SIOM
PSID:          SM_1221000001000
PCI Device Name: /dev/mst/mt4115_pciconf0
Base MAC:      ac1f6b0da004
Versions:
    Current      Available
FW              12.21.1000    N/A
PXE             3.5.0305         N/A
UEFI            14.14.0022        N/A
Status:        No matching image found
```

- To change the add-on card to Ethernet mode (LINK_TYPE=2), please enter command `#mlxconfig -d<vendor_part id>` and then key in "y" to apply the new configuration. (The command below is using the device ID in step 4 on page 3-11). Please note that in changing the setting from Ethernet to InfiniBand mode, the command must specify "LINK_TYPE_P1=1" at the end of the command line.

```
[root@localhost ~]# mlxconfig -d /dev/mst/mt4115_pciconf0
set LINK_TYPE_P1=2
Device #1:
- - - - -
Device type:      ConnectX4
Name:             N/A
Description:     N/A
Device:          /dev/mst/mt4115_pciconf0
Configurations:
                 Next Boot      New
                 LINK_TYPE_P1    IB(1)      ETH(2)
Apply new Configuration? (y/n) [n]:_
```

- Reboot your computer and then the changes made will take effect.
- Once the system is rebooted, you can use the following command to verify whether the LAN port is changed to Ethernet mode or not:

```
[root@localhost ~]# ibv_devinfo
hca_id: mlx5_0
        transport:      InfiniBand (0)
        fw_ver:         12.21.1000
        node_guid:      ac1f:6bff:ff0d:a004
        sys_image_guid: ac1f:6bff:ff0d:a004
        vendor_id:      0x02c9
        vendor_part_id: 4115
        hw_ver:         0x0
        board_id:       SM_1221000001000
        phys_port_cnt:  1
        Device ports:
                port:    1
                        state:      PORT_DOWN (1)
                        max_mtu:    4096 (5)
                        active_mtu: 1024 (3)
                        sm_lid:      0
                        port_lid:   0
                        port_lmc:   0x00
                        link_layer:  Ethernet
```

3-9 Using the Mellanox Controller for PXE Boot

To use PXE boot, the Mellanox (QSFP) port needs to be configured as either Ethernet or InfiniBand mode depending on the previous setup. Please follow the instructions below to use PXE boot.

1. After a QSFP cable is connected, boot up the system and keep pressing <CTRL+B> to boot into FlexBoot Menu:

```
FlexBoot v3.5.305
FlexBoot PCI 17:00.0 3D00 PCI3.00 PnP PMM+13870000+13894000 C900
Press Ctrl-B to configure FlexBoot v3.5.305 (PCI 17:00.0)...
```

2. When the System setup page appears, select "net0: Port1".

```

System setup
-----
Firmware Image Properties
Diagnostics
net0 : Port 1 - 00:00:00:00:00:00
Bus:Device:Function..... 0000:17:00.0
Chip type..... ConnectX-4
Device name..... ConnectX-4
Banner menu timeout..... 4
PCI device ID..... 4115
Virtualization mode..... None
Number of virtual functions..... 16

Ctrl-S - Save and exit Ctrl-R - Restore device default configurations

```

3. And then click on "NIC Configuration". Select "PXE" under "Legacy boot protocol" and select "Ethernet" under "VPI link type". (To use PXE in InfiniBand mode, InfiniBand needs to be selected under "VPI link type".)

```

NIC Configuration
-----
Legacy boot protocol..... PXE
Boot retry count..... No retries
IPv4/IPv6 support..... IPv4
Undi network wait timeout..... 30
Virtual LAN ID..... 1
Virtual LAN mode..... Disabled
VPI link type..... Ethernet

Legacy boot protocol
Select boot protocol priority. If chosen, protocol will be tried first

Ctrl-S - Save and exit Ctrl-D - Delete setting

```

4. Go to BIOS. From the top of the tool bar, select "Boot" to enter the submenu. Select "Network Drive BBS Priorities" and then select "FlexBoot v#. #.###..." under Boot Option #1.



5. To boot from PXE automatically, make sure Boot Option #1 is "Network: Flex boot" as the image shown below.

