



# **InfiniScale<sup>®</sup> IV 36-Port QSFP InfiniBand Switch User Manual**

P/N: MTS3600Q-1UNC, MTS3600Q-2UNC,

MTS3600R-1UNC, MTS3600R-2UNC

Rev 1.3

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#### InfiniScale® IV 36-Port QSFP InfiniBand Switch User Manual

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Mellanox Technologies, Inc.  
2900 Stender Way  
Santa Clara, CA 95054  
U.S.A.  
[www.mellanox.com](http://www.mellanox.com)

Tel: (408) 970-3400

Fax: (408) 970-3403

Mellanox Technologies Ltd  
PO Box 586 Hermon Building  
Yokneam 20692  
Israel

Tel: +972-4-909-7200

Fax: +972-4-959-3245

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## Revision History

Table 1 - Revision History Table

| Date           | Revision | Description                                                                                                      |
|----------------|----------|------------------------------------------------------------------------------------------------------------------|
| October 2008   | Rev 1.3  | Minor Formatting changes.                                                                                        |
| September 2008 | Rev 1.2  | Added Reprogramming the MT3600 Through The I2C Port section.<br>Added power cord OPNs to table 11 in Appendix D. |
| September 2008 | Rev 1.1  | Fixed link to Software package page.                                                                             |
| September 2008 | Rev 1.0  | Initial release                                                                                                  |

## About this Manual

This manual describes the installation and basic use of the Mellanox MTS3600 switch based on the InfiniScale IV InfiniBand switch device.

## Intended Audience

This manual is intended for users and system administrators responsible for installing and setting up the switch platforms listed above.

The manual assumes familiarity with the InfiniBand® Architecture Specification.

## Related Documentation

Additional Documentation available from Mellanox:

Table 2 - Reference Documents

|                                                             |                                                                                                                                                                                                                                                                                                                                   |
|-------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Mellanox Firmware Tools (MFT) User's Manual Document # 2329 | The MFT (Mellanox Firmware Tools) package is a set of firmware tools. The manual supplied with this package provides an overview of the firmware its installation and replacement. The MFT can be downloaded with its documentation at: <a href="http://www.mellanox.com">http://www.mellanox.com</a> under "Firmware" downloads. |
|-------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

## Conventions

Throughout this manual, the name MTS3600 and the term switch are used to describe both the 36-port 40Gb/s InfiniBand Switch and the 36-port QSFP 20Gb/s InfiniBand Switch, unless explicitly indicated otherwise.

## Switch Products Covered in this User's Manual

Table 3 - Switch Products Covered by this User Manual

| Product Number | Description                                                             |
|----------------|-------------------------------------------------------------------------|
| MTS3600Q-1UNC  | 36-port Unmanaged QSFP 40Gb/s InfiniBand switch with one power supply   |
| MTS3600Q-2UNC  | 36-port Unmanaged QSFP 40Gb/s InfiniBand switch with two power supplies |
| MTS3600R-1UNC  | 36-port Unmanaged QSFP 20Gb/s InfiniBand switch with one power supply   |
| MTS3600R-2UNC  | 36-port Unmanaged QSFP 20Gb/s InfiniBand switch with two power supplies |

# 1 Overview

Mellanox MTS3600 switch systems provide the highest performing fabric solution by delivering high bandwidth and low latency to Enterprise Data Centers, High-Performance Computing and Embedded environments. Networks built with MTS3600 systems can carry converged traffic with the combination of assured bandwidth and granular quality of service. Built with Mellanox's 4th generation InfiniScale® IV InfiniBand switch device, MTS3600 systems provide up to 40Gb/s full bidirectional bandwidth per port. With 36 ports, these systems are among the densest switching systems available. These stand-alone switches are an ideal choice for top of-rack leaf connectivity or for building small to medium size clusters.

The switch comes pre-installed with all necessary firmware and configured for standard operation within an InfiniBand fabric, and requires an InfiniBand compliant Subnet Manager running from one of the hosts. All that is required for normal operation is to follow the usual precautions for installation and to connect the switch to the HCAs. Once connected, the Subnet Management software automatically configures and begins utilizing the switch.

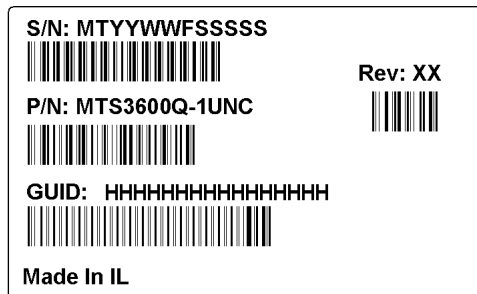
It is recommended that Mellanox OpenFabrics software package be installed on all nodes connected to the MTS3600. The software package provides a subnet manager and network management tools as well as connectivity software for servers and storage, and is available on the Mellanox web site. See Chapter 3 for more information.

Basic installation, hot-swapping components and hardware maintenance is covered in **“Installation and Basic Operation” on page 7.**

## 1.1 Serial Number and Product Version Information

The serial number and product version information are found on the label seen in the figure below.

Figure 1: Generic Product label



Also on this label is the GUID identifier for the switch.

## 2 Installation and Basic Operation

### 2.1 Switch Platform Hardware Overview

Figure 2 shows the front and rear panel views of the QSFP switch. The figure shows port configurations for the switch systems, including the dual hot-swap power supplies, and hot-swap fan module, I2C connector, RJ45 connector, USB connectors, VGA port connector, and various status LEDs.

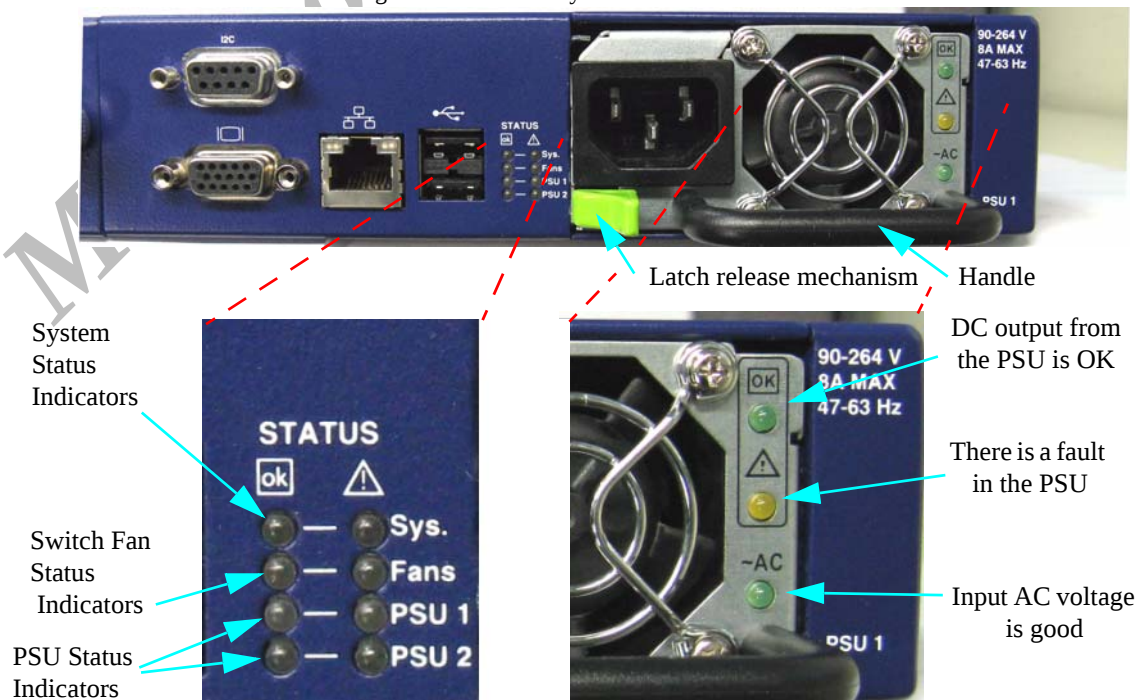
Figure 2: QSFP Switch System Front and Back Panels



All InfiniBand connectivity is via the **rear** panel. All connectors can support active cables.

#### 2.1.1 Status LEDs

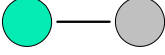
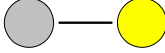
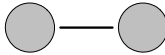
Figure 3: Power and System LEDs



### 2.1.1.1 System Status Indicators

The System Status Indicators are located just to the left of the primary power supply unit, and labeled “Sys.”. The following status conditions are possible:

Table 4 - System Status LED Configurations

| LED Configuration                                                                 | Status                                                                        |
|-----------------------------------------------------------------------------------|-------------------------------------------------------------------------------|
|  | OK – The system is up and running.                                            |
|  | Error –A fault in the system, most likely the firmware did not BOOT properly. |
|  | Off – The system has no power.                                                |

### 2.1.1.2 Power Supply Status Indicators

The MTS3600 36 Port Switch is available with one or two factory installed Power Supply Units. For switches with only one unit installed, a second Power Supply Unit can be added to increase security and to add redundancy.

Figure 4: MTS3600 QSFP Front Panel



The primary power supply unit (PSU1) is located on the right side of the front panel, with PSU2 on the left side. Status indicators are located just to the left of the primary power supply unit. Each PSU also has three status LEDs, on the right side of the PSU, that indicate the internal status of the unit.

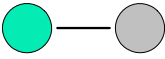
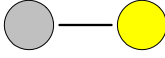
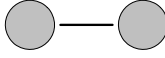
~AC– This LED when lit indicates input voltage between 90 and 264 Volts.

 –This LED when lit indicates a fault in the power supply.

OK – This LED when lit indicates that the output from the power supply is +12VDC.

The PSU status indicators are located just to the left of the primary power supply unit, and labeled “PSU1” and “PSU2”. The following status conditions are possible:

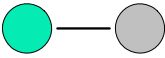
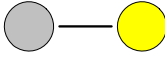
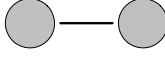
Table 5 - PSU Status LED Configurations

| LED Configuration                                                                 | Status                                                                  |
|-----------------------------------------------------------------------------------|-------------------------------------------------------------------------|
|  | OK – This power supply unit is delivering the correct DC supply.        |
|  | Error – This power supply unit is NOT delivering the correct DC supply. |
|  | Off – This power supply unit is NOT receiving any input power.          |

### 2.1.1.3 Fan Status Indicators

The indicators labeled “Fans” are located just to the left of the primary power supply unit, next to PSU 1. The following fan status conditions are possible:

Table 6 - Fan Status LED Configurations

| LED Configuration                                                                   | Status                                                                                                      |
|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------|
|    | OK – All fans are operating.                                                                                |
|   | Error – One or more fans is not operating. Repair or replace the fan unit.                                  |
|  | Off – The fan unit is not receiving any power. Check that the fan unit is properly and completely inserted. |



All fans must be operating while the power supply is plugged in. Power must be removed within two minutes of the fans failing, to prevent damage to the switch.

### 2.1.2 I<sup>2</sup>C Connector

The MTS3600 supports an I2C compatible interface on the front panel. This interface is used to program firmware into the Flash Memory. Firmware can also be programmed in-band over the InfiniBand network. See Section 3 for more details.

### 2.1.3 Optional Management Interfaces (Advanced Management Only)

The following interfaces allow access to the optional management module. These interfaces have no function in unmanaged systems.

#### 2.1.3.1 VGA Interface

The VGA port is for video output from the management module.

### 2.1.3.2 RJ-45 Ethernet Connector

The Ethernet connection provides access for remote management. The MTS3600 can be connected to an Ethernet switch or the Ethernet port of a computer.

### 2.1.3.3 USB interface

There are two USB ports for connecting a keyboard and mouse for local management operation.

## 2.2 Switch Platform Installation and Operation

Installation and initialization of the switch platform are straightforward processes, requiring attention to the normal mechanical, power, and thermal precautions for rack-mounted equipment.

The switch platform does not require any programming or configuration to operate as a basic InfiniBand switch and includes all of the necessary functionality to operate with external standard InfiniBand Subnet Management software.

This section describes the installation process and basic operation of the switch platform. Please first read the warnings sub-section carefully before carrying on with installation procedures.

### 2.2.1 Installation Safety Warnings

For Safety Warnings in French see Appendix E on page 25, and for German see Appendix F on page 27.

For Special Regulations Regarding Finland, Sweden, Denmark, and Norway see Appendix G on page 29.

#### 1. Installation Instructions



Read all installation instructions before connecting the equipment to the power source.

#### 2. Over-temperature



This equipment should not be operated in an area with an ambient temperature exceeding the maximum recommended: 45°C (113°F). Moreover, to guarantee proper air flow, allow at least 8cm (3 inches) of clearance around the ventilation openings.

#### 3. Stacking the Chassis



The chassis should not be stacked on any other equipment. If the chassis falls, it can cause bodily injury and equipment damage.

#### 4. Redundant Power Supply Connection - Electrical Hazard



This product includes a blank cover over the space for the redundant power supply. Do not operate the product if the blank cover is not securely fastened or if it is removed.

## 5. During Lightning - Electrical Hazard



During periods of lightning activity, do not work on the equipment or connect or disconnect cables.

## 6. Copper InfiniBand Cable Connecting/Disconnecting



Copper InfiniBand 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.

## 7. Rack Mounting and Servicing



When this product is mounted or serviced in a rack, special precautions must be taken to ensure that the system remains stable. In general you should fill the rack with equipment starting from the bottom to the top.

## 8. Equipment Installation



This equipment should be installed, replaced, or serviced only by trained and qualified personnel.

## 9. Equipment Disposal



Disposal of this equipment should be in accordance to all national laws and regulations.

## 10. Local and National Electrical Codes



This equipment should be installed in compliance with local and national electrical codes.

### 2.2.2 Mechanical Installation

The switch platform uses a rack mounted switch designed for installation in a standard 19" rack with all InfiniBand ports on the rear of the enclosure. The front of the switch includes a hot-swap power supply module (with an optional second PSU for redundancy), hot-swap fan tray, and IO ports for an optional CPU advanced management board. The hot-swap fan module provides front to back air flow.

The switch platform contains auto-sensing 90 - 264 VAC connections for all possible PSUs.

The installer should use a rack capable of supporting the mechanical and environmental characteristics of a fully populated switch platform.



The rack mounting holes conform to the IEA-310 standard for 19-inch racks. Take precautions to guarantee proper ventilation for air intake at the front of the chassis and exhaust at the rear in order to maintain good airflow at ambient temperature. Cable routing in particular should not impede the air exhaust from the chassis.

Note: The switch platform can be either front or rear mounted. The notion of “front” and “back” is arbitrary; however, “rear” is used consistently in this manual to refer to the side of the switch with the InfiniBand connectors.

### 2.2.3 Power Connections and Initial Power On

The switch platform ships with one or two Power Supply Units. For switches with only one unit installed, a second PSU may be installed at a later time. Each supply has a separate AC receptacle. The input voltage is auto-adjusting for 90-264 VAC, 47-63Hz power connections. The power cords should be standard 3-wire AC power cords including a safety ground and rated for 15A or higher.



Caution: The switch platform will automatically power on when AC power is applied. There is no power switch. Check all boards, power supplies, and fan tray modules for proper insertion before plugging in a power cable.



Caution: After inserting a power cable and confirming the green system status LED light is on; make sure that the Fan Status indicator shows green.

If the fan status indicator is not green then unplug the power connection and check that the fan module is inserted properly and that the mating connector of the fan unit is free of any dirt and/or obstacles.



Caution: When turning off the switch, make sure **ALL LEDS** are off to ensure a powered down status.

Note: Do not hot swap the power supply if your switch has only one power supply. You must power down the system to replace the power supply unit when there is only one PSU in the switch.

Figure 5: Two Power Inlets - Electric Caution Notifications

#### CAUTION

Risk of electric shock and energy hazard. The two PSUs are independent.

Disconnect all power supplies to ensure a powered down state inside of the switch platform.

#### ACHTUNG

Gefahr des elektrischen Schocks. Entfernen des Netzsteckers eines Netzteils spannungsfrei. Um alle Einheiten spannungsfrei zu machen sind die Netzstecker aller Netzteile zu entfernen

#### ATTENTION

Risque de choc et de danger électriques. Le débranchement d'une seule alimentation stabilisée ne débranchera uniquement qu'un module "Alimentation Stabilisée". Pour isoler complètement le module en cause, il faut débrancher toutes les alimentations stabilisées.

### 2.2.4 Extracting and Inserting the Power Supply Unit

With both power supplies installed in the redundant configuration, either PSU may be extracted without bringing down the system.

Note: Make sure that the PSU that you are NOT replacing is showing all green, for both the PSU and status indicators.

Figure 6: Power Supply Unit Extraction



**To extract a PSU:**

1. Remove the power cord from the power supply unit.
2. Grasping the handle with your right hand, push the green latch release with your thumb while pulling the handle outward. As the PSU unseats, the PSU status indicators will turn off.
3. Remove the PSU.

**To insert a PSU:**

1. Make sure the mating connector of the new unit is free of any dirt and/or obstacles.
2. Insert the PSU by sliding it into the opening until a slight resistance is felt.
3. Continue pressing the PSU until it seats completely. The latch will snap into place confirming the proper installation.
4. Insert the power cord into the supply connector.

Note: The green PSU indicator should light and the yellow indicator should remain off. If not, extract the PSU and re-insert it again.

## 2.2.5 InfiniBand Cable Installation

All cables can be inserted or removed with the unit powered on. To insert a cable, press the connector into the port receptacle until the connector is firmly seated. The GREEN LED indicator, below each QSFP port, 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). After plugging in a cable, lock the connector using the latching mechanism par-

ticular to the cable vendor. When a logical connection is made the yellow light will come on. When data is being transferred the yellow light will blink.

To remove, disengage the locks and slowly pull the connector away from the port receptacle. Both LED indicators will turn off when the cable is unseated.

Care should be taken not to impede the air exhaust flow through the ventilation next to the Infini-Band ports. Cable lengths should be used which allow for routing horizontally around to the side of the chassis before bending upward or downward in the rack.

## 2.2.6 Extracting and Inserting the Fan Unit



**Operation without a fan unit should not exceed two minutes.**

During fan hot-swap, if both indicators are OFF then the fan unit is disconnected.

### To extract a Fan Unit:

1. Loosen the two thumb screws locking the fan tray in place.  
One of the fan status indicators (either green or yellow) will remain on.
2. Pull the fan unit out by pulling on the thumbscrews. As the fan unseats, the fan status indicator will turn off.

### To insert a FAN Unit:

1. Make sure the mating connector of the new unit is free of any dirt and/or obstacles.
2. Insert the fan unit by sliding it into the opening until slight resistance is felt. Continue pressing the fan unit until it seats completely.
3. Turn the two thumb screws to lock the fan unit in place.

Note: The green fan status indicator should light and the yellow fan status should remain off. If not, extract the fan unit and re-insert it. After two unsuccessful attempts to install the fan unit, power off the switch before attempting any system debug.

## 3 Management and Tools Overview

### 3.1 Network Mangement and Clustering Software

Download and install on all nodes the Mellanox OpenFabric software package for Linux, Windows, or other operating systems from the Mellanox software website:

<http://www.mellanox.com/products/software.php>

This software package provides connectivity for server and storage systems utilizing High Performance Computing (HPC) or enterprise data center (EDC) applications across an InfiniBand fabric. It also provides a subnet manager for simple network configuration and network administration and diagnostic tools for network management.

### 3.2 Updating Firmware

The switch is delivered with the latest Firmware available at the time of production. New firmware versions will be posted on the Mellanox firmware download page:

[http://www.mellanox.com/support/firmware\\_table\\_IS4.php](http://www.mellanox.com/support/firmware_table_IS4.php)

You will need the Mellanox Firmware Tools package available in the Mellanox OpenFabrics software package, to update firmware for this switch. It can also be downloaded from:

[http://www.mellanox.com/products/management\\_tools.php](http://www.mellanox.com/products/management_tools.php)

#### 3.2.1 Instructions for Reprogramming Over the InfiniBand Network:

1. Make sure that:
  - a ConnectX adapter is connected to the MTS3600, via an InfiniBand cable
  - the InfiniBand link is active, and
  - Opensm is running
2. Get the LID of the switch. On the host with the ConnectX adapter, run `"/usr/sbin/ibnodes"`. The command will return the following:

```
Ca      : 0x0002c903000587cc ports 2 "adv028 HCA-1"  
Switch  : 0x0002c9000100d050 ports 36 "" base port 0 lid 2 lmc 0
```

In the example above, the switch device has LID number 2. Use device name "lid-2" in order to access the device.

3. Program the MTS3600 firmware by running:

```
flint -d lid-2 -i ./fw-IS4-rel-7_0_142-MTS3600Q_A1.bin b
```

4. Power cycle the switch, by unplugging and replugging the power cord, to load the new firmware.

#### 3.2.2 Reprogramming the MT3600 Through The I2C Port

Use the MTUSB-1 adapter (available from Mellanox) to reprogram the switch firmware using a server or PC running MFT.

Figure 7: MTUSB-1 with Cables



The MTUSB adapter has two connections for cables. One cable is a I2C cable with male connectors on both ends. The other is a USB cable with one type A host connection to be connected to the server or PC and a type B connection to be connected to the MTUSB adapter.

Figure 8: I2C Cable Connected to MTS3600



With the switch connected to a computer through the MTUSB, it is now possible to reprogram the SPI Flash memory.

### 3.2.2.1 Instructions for Reprogramming Through the I2C Port:

1. Make sure that:
  - the MTUSB I2C cable is connected to the switch and USB cable is connected to a computer
  - MFT is running on the computer
  - "mtusb-1" mst device appears in "mst status"

2. Set the MTS3600 I2C switch to allow access by running:

```
isw -d /dev/mst/mtusb-1 -s shark -p L1
```

3. Run the burn command:

```
flint -d /dev/mst/mtusb-1 -i ./fw-IS4-rel-7_0_142-MTS3600Q_A1.bin -qq b
```

4. Power cycle the switch, by unplugging and re-plugging the power cord, to load the new firmware.

## 4 Troubleshooting

As soon as a switch is plugged in make sure that the green power LEDs on the PSU are on.

### Power supply unit:

1. If the ~AC power LED is off, check that the power cable is plugged into a working outlet. Check that the power cable has a voltage within the range of 90 - 264 volts AC.
2. Remove and reinstall the power cable.
3. If the ~AC power LED is green but the OK power LED is off or the  LED is on – Replace the PSU.

### The Status green power LED for PSU1 or PSU2 does not come on:

1. If the OK LED on the PSU is on but the system LED is off remove and reinstall the PSU. Make sure the mating connector of the new unit is free of any dirt and/or obstacles.
2. If the OK LED on the PSU is off, check that OK LED on the PSU Unit is on.
3. Remove and reinstall the power cable. Check that the power outlet (in the wall) is working.
4. Remove and reinstall the PSU. Make sure the mating connector of the new unit is free of any dirt and/or obstacles.
5. Replace the PSU.

### The power LED for the switch shuts off:

1. Check that there is adequate ventilation.
2. Make sure that there is nothing blocking the front or rear of the chassis and that the fan modules and ventilation holes are not blocked (especially dust over the holes).
3. If you find dust blocking the holes it is recommended to clean the fan unit and remove the dust from the front and rear panels of the switch using a vacuum cleaner.

### The green power LED for the fans does not come on:

1. Check that the Power LEDs are on.
2. Remove and reinstall the fan unit. Make sure the mating connector of the new unit is free of any dirt and/or obstacles. See Section 2.2.6, “Extracting and Inserting the Fan Unit,” on page 14.



Caution: Do not run the switch if the System Status LED for the Fans is Yellow!

### The link LED for the InfiniBand connector does not come on:

1. Check that both ends of the cable are connected.
2. Check that the locks on the ends are secured.
3. Make sure that the latest FW version is installed on both the HCA and the switch.
4. If media adapters are used, check that the all connections are good, tight, and secure.

### The activity LED does not come on:

Check that the Subnet Manager has been started.

## Appendix A: Specification

Table 7 - MTS3600Q Specification Data

| Physical                    |                                                                                             | Power and Environmental                               |                                                                                                                                                                            |
|-----------------------------|---------------------------------------------------------------------------------------------|-------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Size:                       | 1.73" (1U) H x 17.5" W x 23.8" D<br>44mm X 444mm X 605mm                                    | Input Voltage:                                        | 90 - 264 VAC 47-63Hz                                                                                                                                                       |
| Weight:                     | 41.45 lbs. 1 PSU<br>44.0 lbs. 2 PSUs                                                        | Power Consumption:                                    | 326W<br>Dissipated Power: 200W<br>Power through connector: 126W                                                                                                            |
| Mounting:                   | 19" Rack mount                                                                              | Temperature:                                          | 10° to 45° Celsius                                                                                                                                                         |
| Air Flow:                   | 70.5CFM                                                                                     | Humidity:                                             | 10% - 90% non-condensing                                                                                                                                                   |
| SerDes Speeds:              | 10, 20, or 40Gb/s per port                                                                  | Shock and Vibration:                                  | ETSI EN 300 019-2-2: 1999-09                                                                                                                                               |
| Connector Types:            | QSFP                                                                                        |                                                       |                                                                                                                                                                            |
| Protocol Support            |                                                                                             | Regulatory Compliance                                 |                                                                                                                                                                            |
| InfiniBand:                 | Auto-Negotiation of (40Gb/s, 20Gb/s, 10Gb/s)                                                | Safety:                                               | US/Canada: cTUVus<br>EU: IEC60950<br>International: CB                                                                                                                     |
| QoS:                        | 8 InfiniBand Virtual Lanes for all ports                                                    | EMC (Emissions):                                      | USA: FCC, Class A<br>Canada: ICES, Class A<br>EU: EN55022, Class A<br>EU: EN55024, Class A<br>EU: EN61000-3-2, Class A<br>EU: EN61000-3-3, Class A<br>Japan: VCCI, Class A |
| Management:                 | Baseboard, Performance, and Device management Agents for full InfiniBand In-Band Management | Environmental:                                        | EU: IEC 60068-2-64: Random Vibration<br>EU: IEC 60068-2-29: Shocks, Type I / II<br>EU: IEC 60068-2-32: Fall Test                                                           |
| Data Rate:                  | QDR                                                                                         | Acoustic:                                             | ISO 7779<br>ETS 300 753                                                                                                                                                    |
|                             |                                                                                             | Sound power level:                                    | 70.5 dB(A) or 7.1 Bel                                                                                                                                                      |
| Scalability and Performance |                                                                                             | Reliability, Availability and Serviceability Features |                                                                                                                                                                            |
| Switching Performance:      | Simultaneous wire-speed any port to any port                                                | Hot-Swappable:                                        | Fan Module and Power Supplies                                                                                                                                              |
| Addressing:                 | 48K Unicast Addresses Max. per Subnet<br>16K Multicast Addresses per Subnet                 | 1+1 Redundant:                                        | Power Supplies                                                                                                                                                             |
| Switching Capacity:         | 2.88Tb/s                                                                                    |                                                       |                                                                                                                                                                            |

Table 8 - MTS3600R Specification Data

| Physical                    |                                                                                             | Power and Environmental                               |                                                                                                                                                                            |
|-----------------------------|---------------------------------------------------------------------------------------------|-------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Size:                       | 1.73" (1U) H x 17.5" W x 23.8" D<br>44mm X 444mm X 605mm                                    | Input Voltage:                                        | 90 - 264 VAC 47-63Hz                                                                                                                                                       |
| Weight:                     | 41.45 lbs. 1 PSU<br>44.0 lbs. 2 PSUs                                                        | Power Consumption:                                    | 316W<br>Dissipated Power: 190W<br>Power through connector: 126W                                                                                                            |
| Mounting:                   | 19" Rack mount                                                                              | Temperature:                                          | 10° to 45° Celsius                                                                                                                                                         |
| Air Flow:                   | 70.5 CFM                                                                                    | Humidity:                                             | 10% - 90% non-condensing                                                                                                                                                   |
| SerDes Speeds:              | 10 or 20 Gb/s per port                                                                      | Shock and Vibration:                                  | ETSI EN 300 019-2-2: 1999-09                                                                                                                                               |
| Connector Types:            | QSFP                                                                                        |                                                       |                                                                                                                                                                            |
| Protocol Support            |                                                                                             | Regulatory Compliance                                 |                                                                                                                                                                            |
| InfiniBand:                 | Auto-Negotiation of (20Gb/s or 10Gb/s)                                                      | Safety                                                | US/Canada: cTUVus<br>EU: IEC60950<br>International: CB                                                                                                                     |
| QoS:                        | 8 InfiniBand Virtual Lanes for all ports                                                    | EMC (Emissions)                                       | USA: FCC, Class A<br>Canada: ICES, Class A<br>EU: EN55022, Class A<br>EU: EN55024, Class A<br>EU: EN61000-3-2, Class A<br>EU: EN61000-3-3, Class A<br>Japan: VCCI, Class A |
| Management:                 | Baseboard, Performance, and Device management Agents for full InfiniBand In-Band Management | Environmental                                         | EU: IEC 60068-2-64: Random Vibration<br>EU: IEC 60068-2-29: Shocks, Type I / II<br>EU: IEC 60068-2-32: Fall Test                                                           |
| Data Rate:                  | DDR                                                                                         | Acoustic                                              | ISO 7779<br>ETS 300 753                                                                                                                                                    |
|                             |                                                                                             | Sound power level:                                    | 70.5 dB(A) or 7.1 Bel                                                                                                                                                      |
| Scalability and Performance |                                                                                             | Reliability, Availability and Serviceability Features |                                                                                                                                                                            |
| Switching Performance:      | Simultaneous wire-speed any port to any port                                                | Hot-Swappable:                                        | Fan Module and Power Supplies                                                                                                                                              |
| Addressing:                 | 48K Unicast Addresses Max. per Subnet<br>16K Multicast Addresses per Subnet                 | 1+1 Redundant:                                        | Power Supplies                                                                                                                                                             |
| Switching Capacity:         | 1.44Tb/s                                                                                    |                                                       |                                                                                                                                                                            |

## A.1 EMC Certification Statements

Table 9 lists the approved certification status per switch in different regions of the world

Table 9 - Switch Certification Status

| Switch P/N    | FCC Class (USA) | EN Class (Europe) | ICES Class (Canada) | VCCI (Japan) | C-Tick (Australia New Zealand)                                                    | IEC/EN                                                                              | cTUVus                                                                              | CB                                                                                  |
|---------------|-----------------|-------------------|---------------------|--------------|-----------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| MTS3600R-1UNC | A               | A                 | A                   | A            |  |  |  |  |
| MTS3600Q-1UNC | A               | A                 | A                   | A            |  |  |  |  |

### A.1.1 FCC Statements (USA)

#### Class A Statements:

##### § 15.21

#### Statement

**Warning!** Changes or modifications to this equipment not expressly approved by the party responsible for compliance (Mellanox Technologies) could void the user's authority to operate the equipment.

##### §15.105(a)

#### Statement

NOTE: This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

### A.1.2 EN Statements (Europe)

#### EN55022 Class A Statement:

##### **Warning**

This is a class A product. In a domestic environment this product may cause radio interference in which case the user may be required to take adequate measures.

### A.1.3 ICES Statements (Canada)

#### Class A Statement:

"This Class A digital apparatus complies with Canadian ICES-003.  
Cet appareil numérique de la classe A est conforme à la norme NMB-003 du Canada."

### A.1.4 VCCI Statements (Japan)

#### Class A Statement:

この装置は、情報処理装置等電波障害自主規制協議会（VCCI）の基準に基づくクラスA情報技術装置です。この装置を家庭環境で使用すると電波妨害を引き起こすことがあります。この場合には使用者が適切な対策を講ずるよう要求されることがあります。

A.1.5 (Translation - "This is a Class A product based on the standard of the Voluntary Control Council for Interference by Information Technology Equipment (VCCI). If this equipment is used in a domestic environment, radio interference may occur, in which case the user may be required to take corrective actions.")

## Appendix B: Switch Hardware Components



## Appendix C: QSFP Interface

|    |         |         |    |
|----|---------|---------|----|
| 20 | GND     | GND     | 19 |
| 21 | Rx2n    | Rx1n    | 18 |
| 22 | Rx2p    | Rx1p    | 17 |
| 23 | GND     | GND     | 16 |
| 24 | Rx4n    | Rx3n    | 15 |
| 25 | Rx4p    | Rx3p    | 14 |
| 26 | GND     | GND     | 13 |
| 27 | ModPrsL | SDA     | 12 |
| 28 | IntL    | SCL     | 11 |
| 29 | VccTx   | Vcc Rx  | 10 |
| 30 | Vcc1    | ResetL  | 9  |
| 31 | LPMode  | ModSelL | 8  |
| 32 | GND     | GND     | 7  |
| 33 | Tx3p    | Tx4p    | 6  |
| 34 | Tx3n    | Tx4n    | 5  |
| 35 | GND     | GND     | 4  |
| 36 | Tx1p    | Tx2p    | 3  |
| 37 | Tx1n    | Tx2n    | 2  |
| 38 | GND     | GND     | 1  |

Table 10 - InfiniBand QSFP Connector Pinout

| Connector Pin Number | Connector Pin Name | Signal Description                  |
|----------------------|--------------------|-------------------------------------|
| 1                    | GND                | Ground                              |
| 2                    | Tx2n               | Transmitter Inverted Data Input     |
| 3                    | Tx2p               | Transmitter Non-Inverted Data Input |
| 4                    | GND                | Ground                              |
| 5                    | Tx4n               | Transmitter Inverted Data Input     |
| 6                    | Tx4p               | Transmitter Non-Inverted Data Input |
| 7                    | GND                | Ground                              |
| 8                    | ModSelL            | Module Select                       |
| 9                    | ResetL             | Module Reset                        |
| 10                   | Vcc Rx             | +3.3 V Power supply receiver        |
| 11                   | SCL                | 2-wire serial interface clock       |
| 12                   | SDA                | 2-wire serial interface data        |
| 13                   | GND                | Ground                              |
| 14                   | Rx3p               | Receiver Non-Inverted Data Output   |
| 15                   | Rx3n               | Receiver Inverted Data Output       |
| 16                   | GND                | Ground                              |
| 17                   | Rx1p               | Receiver Non-Inverted Data Output   |
| 18                   | Rx1n               | Receiver Inverted Data Output       |
| 19                   | GND                | Ground                              |
| 20                   | GND                | Ground                              |
| 21                   | Rx2n               | Receiver Inverted Data Output 3     |
| 22                   | Rx2p               | Receiver Non-Inverted Data Output 3 |
| 23                   | GND                | Ground                              |
| 24                   | Rx4n               | Receiver Inverted Data Output 3     |
| 25                   | Rx4p               | Receiver Non-Inverted Data Output 3 |
| 26                   | GND                | Ground                              |
| 27                   | ModPrsL            | Module Present                      |
| 28                   | IntL               | Interrupt                           |
| 29                   | Vcc Tx             | +3.3 V Power supply transmitter     |
| 30                   | Vcc 1              | +3.3 V Power Supply                 |
| 31                   | LPMode             | Low Power Mode                      |
| 32                   | GND                | Ground                              |
| 33                   | Tx3p               | Transmitter Non-Inverted Data Input |
| 34                   | Tx3n               | Transmitter Inverted Data Input     |
| 35                   | GND                | Ground                              |
| 36                   | Tx1p               | Transmitter Non-Inverted Data Input |
| 37                   | Tx1n               | Transmitter Inverted Data Input     |
| 38                   | GND                | Ground                              |

## Appendix D: Replacement Parts Ordering Numbers

Table 11 - Replacement Parts Ordering Numbers

| Part Description                                                                | OPN       |
|---------------------------------------------------------------------------------|-----------|
| Power Supply Unit PSU<br>This Replacement part is for both the PSU 1 and PSU 2. | POW000018 |
| Fan Unit for QSFP                                                               | MEC000960 |
| Power cord Type B for USA, Canada, Mexico, Taiwan                               | ACC000204 |
| Power cord Type H for Israel                                                    | ACC000205 |
| Power cord Type E/F for Sweeden, France, Germany, Netherlands, Russia           | ACC000207 |
| Power cord Type G for UK                                                        | ACC000208 |
| Power cord Type D for India                                                     | ACC000209 |
| Power cord Type I for China                                                     | ACC000210 |
| Power cord Type J for Switzerland                                               | ACC000211 |
| Power cord Type B for Japan,                                                    | ACC000212 |
| Power cord Type I for Australia                                                 | ACC000213 |

## Appendix E: Avertissements de sécurité d'installation (French)

### 1. Instructions d'installation



Lisez toutes les instructions d'installation avant de brancher le matériel à la source d'alimentation électrique.

### 2. Température excessive



Ce matériel ne doit pas fonctionner dans une zone avec une température ambiante dépassant le maximum recommandé de 45°C (113°F). En outre, pour garantir un bon écoulement de l'air, laissez au moins 8 cm (3 pouces) d'espace libre autour des ouvertures de ventilation.

### 3. Empilage du châssis



Le châssis ne doit pas être empilé sur un autre matériel. Si le châssis tombe, il peut provoquer des blessures corporelles et des dégradations de biens.

### 4. Connection d'Alimentation électrique excédentaire -dangers électriques



Ce produit comporte un couvercle transparent sur l'espace pour l'alimentation électrique redondante.

Ne pas faire fonctionner le produit si le couvercle transparent n'est pas solidement fixé ou s'il est enlevé.

### 5. Orages – dangers électriques



Pendant un orage, il ne faut pas utiliser le matériel et il ne faut pas brancher ou débrancher les câbles.

### 6. Branchement/débranchement des câbles InfiniBand en cuivre



Les câbles InfiniBand en cuivre sont lourds et ne sont pas flexibles, il faut donc faire très attention en les branchant et en les débranchant des connecteurs. Consultez le fabricant des câbles pour connaître les mises en garde et les instructions spéciales.

### 7. Montage et entretien sur baie



Lorsque ce produit est monté ou entretenu sur baie, il faut prendre des précautions spéciales pour s'assurer que le système reste stable. En général, il faut remplir la baie avec du matériel de bas en haut.

### 8. Installation du matériel



Ce matériel ne doit être installé, remplacé ou entretenu que par du personnel formé et qualifié.

### 9. Elimination du matériel



L'élimination de ce matériel doit s'effectuer dans le respect de toutes les législations et réglementations nationales en vigueur.

### 10. Codes électriques locaux et nationaux



Ce matériel doit être installé dans le respect des codes électriques locaux et nationaux.

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## Anhang F: Installation - Sicherheitshinweise (German)

### 1. Installationsanleitungen



Lesen Sie alle Installationsanleitungen, bevor Sie das Gerät an die Stromversorgung anschließen.

### 2. Übertemperatur



Dieses Gerät sollte nicht in einem Bereich mit einer Umgebungstemperatur über der maximal empfohlenen Temperatur von 45°C (113°F) betrieben werden. Außerdem sollten mindestens 8 cm (3 in.) Freiraum um die Belüftungsöffnungen sein, um einen einwandfreien Luftstrom zu gewährleisten.

### 3. Stapeln des Chassis



Das Chassis sollte nicht auf andere Geräte gestapelt werden. Wenn das Chassis herunterfällt, kann es zu Verletzungen und Beschädigungen an Geräten führen.

### 4. Redundanter Stromversorgungsanschluss - Elektrische Gefahr



Dieses Produkt verfügt über eine Abdeckung über dem Bereich für die redundante Stromversorgung. Betreiben Sie das Produkt nicht, wenn diese Abdeckung nicht sicher fest sitzt oder entfernt wurde.

### 5. Bei Gewitter - Elektrische Gefahr



Arbeiten Sie während eines Gewitters und Blitzschlag nicht am Gerät, schließen Sie keine Kabel an oder ab.

### 6. Anschließen/Trennen von InfiniBand-Kupferkabel



InfiniBand-Kupferkabel sind schwer und nicht flexible. Deshalb müssen sie vorsichtig an die Anschlüsse angebracht bzw. davon getrennt werden. Lesen Sie die speziellen Warnungen und Anleitungen des Kabelherstellers.

### 7. Rack-Montage und Wartung



Wenn dieses Produkt in einem Rack montiert oder gewartet wird, sind besondere Vorsichtsmaßnahmen zu ergreifen, um die Stabilität des Systems zu gewährleisten. Im Allgemeinen sollten Sie das Gestell von unten nach oben mit Geräten füllen.

## 8. Geräteinstallation



Dieses Gerät sollte nur von geschultem und qualifiziertem Personal installiert, ausgetauscht oder gewartet werden.

## 9. Geräteentsorgung



Die Entsorgung dieses Geräts sollte unter Beachtung aller nationalen Gesetze Bestimmungen erfolgen.

## 10. Regionale und nationale elektrische Bestimmungen



Dieses Gerät sollte unter Beachtung der regionalen und nationalen elektrischen Bestimmungen installiert werden.

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## Appendix G: Special Regulations Regarding Finland, Sweden, Denmark, and Norway

**Denmark-** This unit is class I and must be connected with an AC cord compliant with all national electrical codes in Denmark. The AC cord shall have an integral ground wire, and can only be plugged into a fully grounded outlet.



Do not connect this unit to any outlet that is not fully grounded!

- **Finland -**



“Laite on liitettävä suojamaadoituskoskettimilla varustettuun pistorasiaan”

- **Norway -**



“Apparatet må tilkoples jordet stikkontakt”

Unit is intended for connection to IT power systems for Norway only.

- **Sweden -**



“Apparaten skall anslutas till jordat uttag.”