ConnectX®-2 VPI Dual Port QSFP and SFP+ Card User's Manual

P/N: MHZH29-XTR, MHZH29-XSR
Rev 1.0

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ConnectX-2 VPI InfiniBand and Ethernet Adapter Card User’s Manual

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Revision History

This document was printed on 11/3/09.

Table 1 - Revision History Table

Date	Rev	Comments/Changes
October 2009	1.0	Initial Release

About this Manual

This *User's Manual* describes Mellanox Technologies ConnectX®-2 VPI IB and Ethernet PCI Express x8 adapter cards. It provides details as to the interfaces of the board, specifications, required software and firmware for operating the board, and relevant documentation.

Intended Audience

This manual is intended for the installer and user of these cards.

The manual assumes basic familiarity with InfiniBand® and Ethernet networks and architecture specifications.

Related Documentation

Table 2 - Documents List

Mellanox Firmware Tools (MFT) User's Manual Document no. 2204UG	User's Manual describing the set of MFT firmware management tools for a single InfiniBand node. See http://www.mellanox.com > Downloads > Firmware Tools
IBTA Specification Release 1.2.1	InfiniBand Architecture Specification
IEEE Std 802.3 Specification	This is the IEEE Ethernet specification http://standards.ieee.org/getieee802
PCI Express 2.0 Specifications	Industry Standard PCI Express 2.0 Card Electromechanical Specification, Rev 1.3.

Online Resources

- Mellanox Technologies Web pages: http://www.mellanox.com
- Mellanox Technologies Firmware download Web page:
  http://www.mellanox.com => Downloads => Firmware

Document Conventions

When discussing memory sizes, MB and MBytes are used in this document to mean size in mega bytes. The use of Mb or Mbits (small b) indicates size in mega bits.

1 Overview

This document is a *User's Manual* for Mellanox Technologies network VPI adapter cards based on the MT25408 ConnectX®-2 VPI integrated circuit device. The cards described in this manual have the following main features:

- IBTA v1.2.1 compliant
- IEEE Std 802.3 compliant
- QSFP port for connecting InfiniBand traffic at 10Gb/s (SDR), 20Gb/s (DDR), or 40Gb/s (QDR)
- SFP+ port for connecting Ethernet traffic at 10 Gb/s
- Compliant with QSFP MSA spec Rev. 1.0
- Compatible with copper cables and optical cables with the use of QSFP and SFP+ connectors
- PCI Express 2.0 (1.1 compatible) through an x8 edge connector up to 5GT/s
- 'Media detect circuit' with powered connector support for the use of active cables and external PHY fiber solutions
- EU Restriction of Hazardous Substances (RoHS) compliant
- 10 Gb/s Ethernet

1.1 Adapter Cards

The MHZH29 card is a VPI adapter card with a 40Gb/s InfiniBand QSFP connector and a 10GigE SFP+ connector.

The QSFP connector is compatible with:

- Gigabit Ethernet
- InfiniBand Architecture Specifications
- Fibre Channel

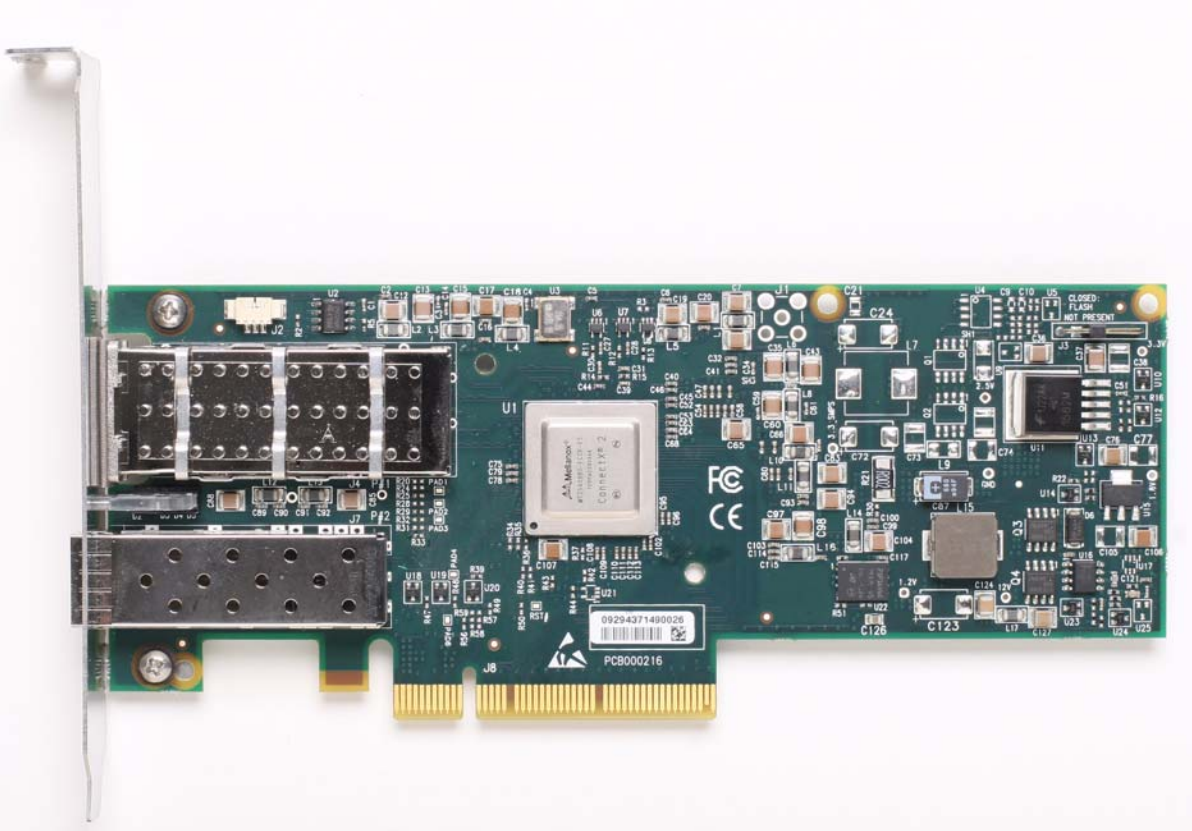
The SFP+ connector is compatible with 10GigE.

Table 3 lists the VPI adapter cards described in this manual.

Table 3 - Adapter Cards List

Ordering Part Number (OPN)	IB QSFP Port Speed	ETH SFP+ Port Speed	Short / Tall Bracket	RoHS	Adapter IC Part Number
MHZH29-XTR	40Gb/s (QDR)	10Gb/s	Tall	RoHS-R6	MT25408B0-FCCR-QI
MHZH29-XSR	40Gb/s (QDR)	10Gb/s	Short	RoHS-R6	MT25408B0-FCCR-QI

Figure 1: Component Side



1.2 Mellanox Part Numbering Legend

Table 4 describes the Mellanox Technologies adapter cards part numbering legend.

Table 4 - Mellanox Cards Part Numbering Key

Adapter Card OPN MHTS#I-XBR	Field	Decoder
M	Mellanox Technolo-gies	
H	Adapter Type	H = InfiniBand Host Channel Adapter, N = Ethernet Network Interface Card,
T	Media	E = CX4 SDR, G = CX4 DDR, J = CX4 QDR, Q = QSFP QDR, R = QSFP DDR, T = UTP, Z = one SFP+ connector and one QSFP connector
S	Silicon	H = ConnectX®, S = InfiniHost III Lx®, T= InfiniHost®,A = InfiniHost III Ex, S = InfiniHost III Lx, T = InfiniHost
#	# ports	1 = 1, 2 = 2,

Table 4 - Mellanox Cards Part Numbering Key

Adapter Card OPN MHTS#I-XBR	Field	Decoder
I	Host Interface	X = PCI-X, 4 = PCIe x4, 8 = PCIe x8, 9 = PCIe (SerDes @ 5.0 GT/s)
G	Generation	<blank> = Initial product generation
-	Separator	
X	Memory Size	X = MemFree, 1=128MB, 2=256MB, 3=512MB
B	Bracket	S = Short, T = Tall, N = None
R	RoHS	<blank> = non RoHS, C = RoHS R-5 w/ Exemption, R = RoHS R-6 Lead-Free

For example, the part number MHZH29-XTR describes Mellanox Technologies' ConnectX-2 card with dual ports one SFP+ and one QSFP, a PCIe2.0 x8 5.0GT/s interface, no on-board memory (mem-free), a short PCI bracket, and RoHS R5 compliance. Using the legend,

- field M = M to indicate a Mellanox Technologies product,
- field H = H to indicate an InfiniBand Adapter Card,
- field T = Z to indicate QSFP (IB QDR) and SFP+ (10GigE),
- field S = H to indicate the ConnectX family,
- field # = 2 to indicate two ports,
- field I = 9 to indicate PCI Express 2.0 x8 running at 5.0GT/s,
- field X = X to indicate no on-board memory,
- field B = T to indicate a tall bracket, and
- field R = R to indicate RoHS R6 (lead free) compliance

1.3 Finding the GUID/MAC and Serial Number on the Adapter Cards

All Mellanox adapter cards have a label on the printed side of the adapter card that has the card serial number, the card MAC for Ethernet protocol and the card GUID for InfiniBand protocol. VPI Cards have both a MAC and a GUID.

Figure 2: Card Product Label

2 VPI Adapter Card Installation

2.1 Hardware and Software Requirements

Before installing the adapter card, please make sure that the system meets the hardware and software requirements listed in Table 5, “Hardware and Software Requirements”. Refer to Chapter 3,“Driver Software and Firmware” on page 17 for download and installation instructions.

Table 5 - Hardware and Software Requirements

Requirement	Description
Hardware	PCI Express x8 or x16 slots

Software Operating Systems/Distributions	• For Windows
	  • IB see http://www.mellanox.com => Downloads => InfiniBand SW/ Windows Drivers
	  • Ethernet see http://www.mellanox.com => Downloads => Ethernet SW/ Windows Drivers
	• For Linux, both the InfiniBand and Ethernet drivers are in the Mellanox OpenFabrics Enterprise Distribution (OFED) software package available via the Mellanox OpenFabrics Web site http://www.mellanox.com => Downloads => InfiniBand/VPI SW/ Linux Drivers

2.2 Installation Instructions

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

2.2.1 Installation Instructions as per Host Machine

The adapter cards listed in Table 3 on page 8 are standard PCI Express cards, each with a standard x8 edge connector. Please consult the host machine documentation for instructions on how to install a PCI Express card.

2.3 Safety Warnings

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: 55°C (131°F).
To guarantee proper air flow, allow at least 8cm (3 inches) of clearance around the ventilation openings.

3. During Lightning - Electrical Hazard

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

4. 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.

5. Equipment Installation

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

6. Equipment Disposal

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

7. Local and National Electrical Codes

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

8. Exposure to Radiation

Caution – Use of controls or adjustment or performance of procedures other than those specified herein may result in hazardous radiation exposure.

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+ A2:2001

2.4 Cables and Modules

This card can be connected using direct copper cables or optical cables using an SFP+ transceiver module. Copper cables can be both active and passive.

The adapter cards are shipped without optical modules. Approved modules must be purchased from Mellanox. The OPNs for the approved Mellanox modules are MFM1T02A-SR and MFM1T02A-LR. The figure below shows the Mellanox approved SFP+ module.

Note: SR and LR modules not recommended by Mellanox may not work with the adapter.

Figure 3: SFP+ Transceiver Module

2.4.1 Inserting the Optical Transceiver Module

To insert the module into the cage:

1. Open the module's locking mechanism – see Figure 4 and Figure 5.
2. Make sure that the male connectors on the module will align with the female connectors inside of the cage. Also check that there is no dirt or foreign matter in the module or in the cage.

Figure 4: Module With Locking Mechanism Closed

Figure 5: Module With Locking Mechanism Open

3. Insert the module into the adapter card module cage.
4. Close the locking Mechanism.

To remove the module from the cage:

1. Unlock the locking mechanism by opening the handle.
2. Pull the module out of the cage.

2.4.2 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 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 particular to the cable vendor. When a logical connection is made the YELLOW LED will come on. When data is being transferred the YELLOW LED will blink.

Note: When installing cables make sure that the latches engage.

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

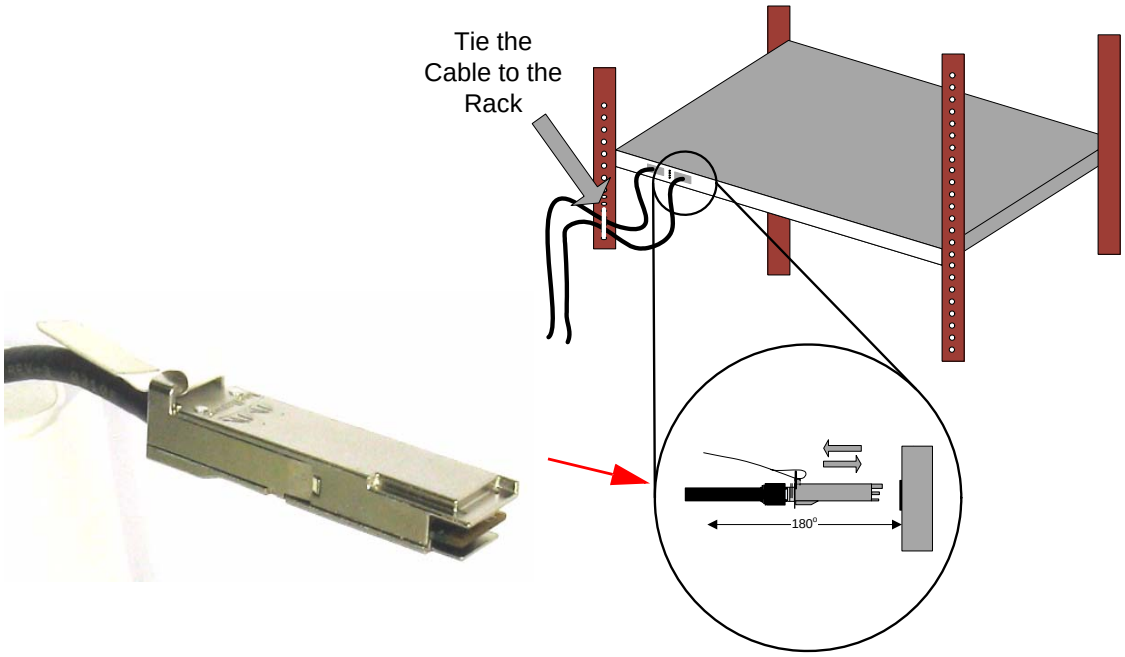
To remove a cable, disengage the locks and slowly pull the connector away from the port receptacle. Both LED indicators will turn off when the cable is unseated.

Cables, especially long copper cables, can weigh a substantial amount. Make sure that the weight of the cable is supported on its own and is not hanging from the adapter card.

2.4.2.1 Inserting a Cable into the Adapter Card

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 up side 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.
4. Make sure that the connector locks in place.

Figure 6: Connector Orientation



2.4.2.2 Removing a Cable from the Adapter Card

1. Pull on the latch release mechanism thereby unlatching the connector and pull the connector out of the cage.
2. Do not apply torque to the connector when removing it from the adapter card.

3. Remove any cable supports that were used to support the cable's weight.

2.5 Cable Lengths

Mellanox Cards support up to 40 Gb/s IB and Ethernet over the QSFP port, and up to 10Gb/s on the SFP+ connector.

2.5.1 InfiniBand Connectivity

These Mellanox Cards support QSFP passive copper connectivity up to 7 meters, and active cable support up to 50 meters.

2.5.2 Ethernet Connectivity

These Mellanox Cards support ethernet connectivity as defined in IEEE Std 802.3. ae standard.

The described adapter cards can be connected to switches and routers using cable lengths as specified in the tables below.

Table 6 - Max SR Cable Lengths

Cable	Max Length of Approved Cable
OM-2	82m
OM-3	330m

Table 7 - Max LR Cable Lengths

Cable	Max Length of Approved Cable
SMF	10 Km

These cards are able to support direct attached copper cables. Check www.mellanox.com => Products => Cables for cable recommendations regarding direct attached copper cables.

3 Driver Software and Firmware

3.1 Driver Software

For Linux, download and install the latest OpenFabrics Enterprise Distribution (OFED) software package available via the Mellanox OpenFabrics Web site at:
http://www.mellanox.com => Downloads => InfiniBand/VPI SW/Drivers. Follow the installation instructions included in the download package.

3.2 Updating Adapter Card Firmware

Each card is shipped with the latest version of qualified firmware at the time of manufacturing. Firmware is updated occasionally, and the most recent firmware can be obtained from
http://www.mellanox.com => Downloads => Firmware.

3.3 Single Adapter Card Firmware Update

Firmware can be updated on the stand alone single card using the **flint** tool of the *Mellanox Firmware Tools (MFT)* package. This package is available for download, along with its user's manual, from the Mellanox Firmware Tools page. See http://www.mellanox.com => Downloads => Firmware Tools.

A firmware binaries table lists a binary file per adapter card. The file name of each such binary is composed by combining the firmware name, the firmware release version, and the card part number. Please contact Mellanox or your assigned Field Application Engineer if you cannot find the firmware binary for your adapter card. This may happen if the product is not yet available for general distribution.

4 Adapter Card Interfaces

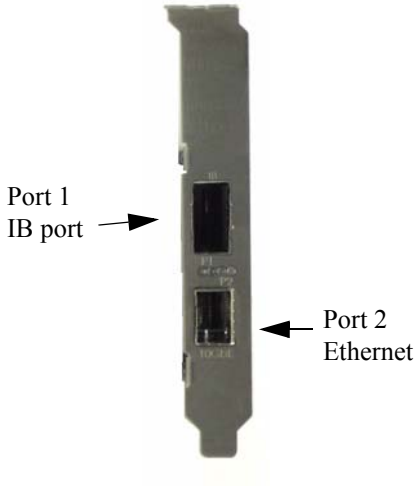
4.1 I/O Interfaces

Each adapter card includes the following interfaces:

- QSFP Optical Connector
- SFP+ Ethernet Connector
- PCI Express x8 edge connector
- I/O panel LEDs
- I^2C compatible connector (for debug)

Port 1 connects to the IB port of the device, while port 2 connects to the Ethernet port of the device. See Figure 7,"Port Numbering"

Figure 7: Port Numbering



4.1.1 InfiniBand Interface

The ConnectX-2 VPI device (MT25408B0) is compliant with the *InfiniBand Architecture Specification, Release 1.2.1.* It has a compliant 4X InfiniBand port, with four Tx/Rx pairs of SerDes. Each of the VPI adapter cards (listed in Table 3 on page 8) based on this device provides access to its port by means of a QSFP connector.

This port utilizes a 'media detect circuit' that supports active copper cables and fiber solutions to be connected to the InfiniBand port connectors.

4.1.2 Ethernet SFP+ Interface

The ConnectX®-2 device is compliant with the *IEEE Std 802.3ae 10 Gigabit Ethernet* and the *IEEE Std 802.3aq 10GBASE LRM.* The SFP+ port has one Tx/Rx pair of SerDes. Each of the cards (listed in Table 3 on page 8) based on this device provides access to their Ethernet port by means of copper or optical cables.

4.1.3 PCI Express Interface

The ConnectX-2 adapter cards support PCI Express 2.0 (1.1 compatible) through an x8 edge connector.

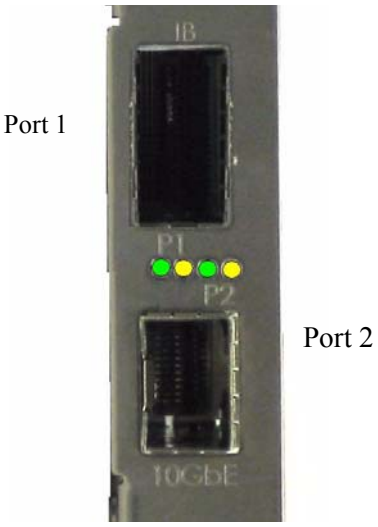
4.1.4 LED Assignment

The board has I/O LEDs located on the I/O panel. The green LED, when lit, indicates that the driver is running and a valid physical connection between nodes exists. If the green LED is blinking, it indicates a problem with the physical link. The yellow LED when lit, indicates a valid data activity link, this is the logical link. The yellow LED illuminates when the network is discovered over the physical link. A valid data activity link without data transfer is designated by a constant yellow LED indication. A valid data activity link with data transfer is designated by a blinking yellow LED indication. If the LEDs are not active, either the physical link or the logical link (or both) connections have not been established.

Figure 8: Physical and Logical Link Indications

Table 8 - LEDs

Port Number	LED Name
Port 1	Physical Link - Green Constant on indicates a good physical link Blinking indicates a problem with the Physical link
	Data Activity - Yellow Blinking indicates Data Transfer Constant on indicates no Data Transfer
Port 2	Physical Link - Green Constant on indicates a good physical link Blinking indicates a problem with the Physical link
	Data Activity - Yellow Blinking indicates Data Transfer Constant on indicates no Data Transfer



Note: The short bracket has the same port and LED footprint as the tall bracket.

4.1.5 I²C Compatible Interface

A three-pin header on the adapter card is provided as the I^2C compatible interface. See Figure 13,"Schematic of the ConnectX-2 MHZH Adapter Card" for the location on the board.

Figure 9: I²C Connector

4.2 Power

All adapter cards receive 12V and 3.3V power from the PCI Express Edge connector. All other required power voltages are generated by on-board switch mode regulators. See "Specifications" on page 25.

4.3 Memory

The adapter cards support multiple memory devices through the PCI Flash, and I2C-compatible interfaces. The adapter card utilizes the PCI Express interface to store and access IB fabric and/or EN fabric connection information and packet data on the system memory.

4.3.1 Flash

Each of the adapter cards include one 16MB SPI Flash device M25P16-VME6G device by ST Microelectronics) accessible via the Flash interface of the MT25408B0 ConnectX-2 VPI device.

There is a jumper on each adapter card that indicates to the device whether an on-board Flash device is to be used. Table 9 provides information on this jumper. See Figure 13,"Schematic of the ConnectX-2 MHZH Adapter Card" for the jumper location.

Table 9 - Jumper Configuration

Description	Option	Card Default Configuration	Comments
Flash present/ not present	connection open – Flash present connection shorted – Flash not present ***Figure 10: Flash Jumper*** 	connection open – Flash present	Header 1x2

4.3.2 EEPROM

Each board incorporates an EEPROM that is accessible through the I2C-compatible interface. The EEPROM is used for storing the Vital Product Data (VPD). The VPD format adheres to the *PCI Local Bus Specification Rev 2.3* VPD definition. The EEPROM capacity is 4Kb.

4.4 VPD Layout for these Adapter Cards

The PCI VPD (Vital Product Data) layout, for each of the described Mellanox Technologies ConnectX-2 VPI adapter cards comply with the format defined in the *PCI 2.3 Specification, Appendix I*. All ConnectX-2 adapter cards have the same PCI VPD layout.

4.4.1 PCI VPD Layout

Table 10 - VPD Layout for MHZH29-X[ST]R

Offset (Decimal)	Item	Value	Format	Description
0	Large Resource Type ID String Tag (0x02)	0x82		
1	Length [7:0] LSB	0x6		
2	Length [15:8] MSB	0x0		
3	Data	RAPTOR	STR	
9	Large Resource Type VPD-R Tag (0x10)	0x90		
10	Length [7:0] LSB	0x4F		
11	Length [15:8] MSB	0x00		
12	VPD Keyword	PN	STR	Add in Card Part Number
14	Length	0x15		
15	PN	PN	%STR_SPC	
36	VPD Keyword	EC	STR	Engineering Change Level of the card (rev)
38	Length	0x2		
39	Revision	RV	%STR	PCB revision
41	VPD Keyword	SN	STR	Serial Number
43	Length	0x18		
44	SerialNumber		%STR_SPC	"00..00XXXX..XX"
68	VPD Keyword	V0	STR	Misc Information
70	Length	0x10		
71	Data	PCIe Gen2 x8	STR_SPC	
87	VPD Keyword	RV	STR	
89	Length	0x1		
90	Data	0,89	%CS0	
91	Large Resource Type VPD-W Tag (0x11)	0x91		
92	Length [7:0] LSB	0xA1		
93	Length [15:8] MSB	0x00		
94	VPD Keyword	V1	STR	EFI Driver version
96	Length	0x6		
97	Data	N/A	STR_SPC	
103	VPD Keyword	YA	STR	Asset Tag

Table 10 - VPD Layout for MHZH29-X[ST]R

Offset (Decimal)	Item	Value	Format	Description
105	Length	0x20		
106	Data	N/A	STR_SPC	“N/A”
138	VPD Keyword	RW	STR	Remaining read/write area
140	Length	0x72		
141	Data		STR_ZERO	Reserved (0x00)
255	Small Resource Type END Tag (0x11)	0x78		

5 Replacing a Tall Bracket With a Short Bracket

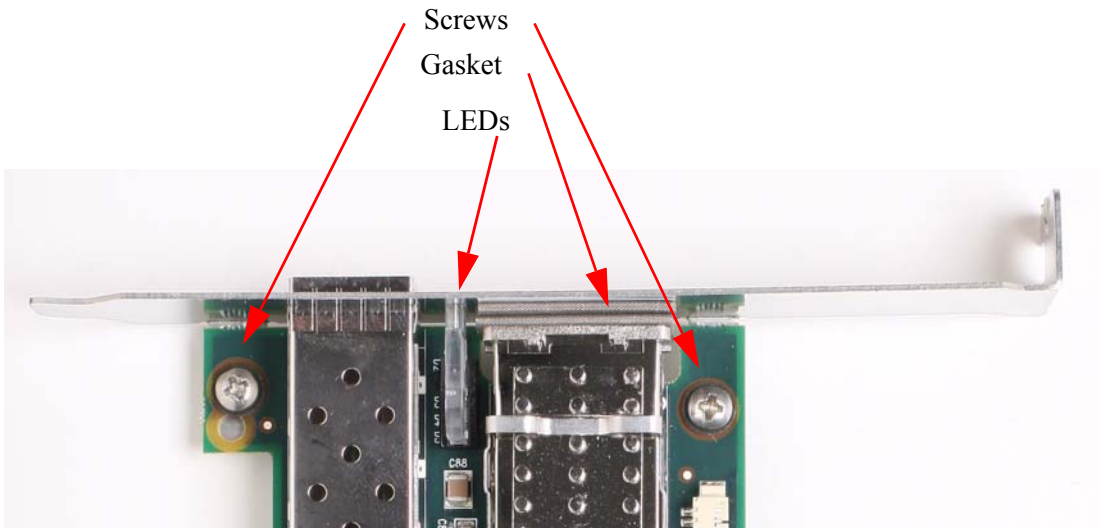
This section provides instructions on how to remove the tall bracket of a standard Mellanox Technologies adapter card and replace it with a short one.

To replace the bracket you will need the following parts:

- the new bracket of the proper height
- one new square gasket
- the 2 screws saved from the removal of the bracket
- the 2 fiber washers saved from the removal of the bracket

5.1 Remove the Existing Bracket from the Adapter Card

Figure 11: Adapter Card



1. Remove the two screws holding the bracket in place.
2. The bracket comes loose from the card.

   Note: Be careful not to put stress on the LEDs.

3. Save the two screws and the two fiber washers.

5.2 Installing the New Bracket

1. Remove the paper to expose the adhesive on the gasket.
2. Place the extra square gasket onto the new bracket. Make sure to correctly align the gasket with the hole in the bracket.

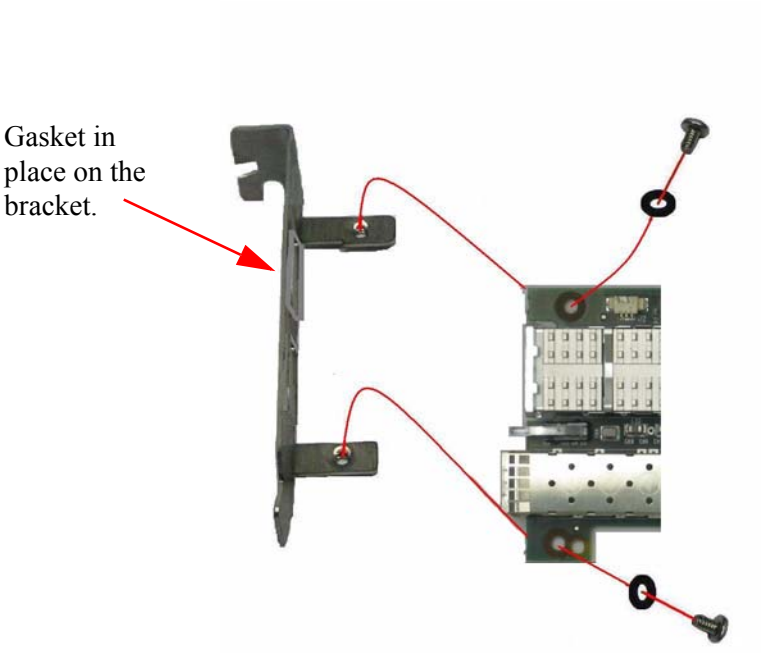
Note: If the old gasket is still on the card, remove it before installing the new bracket. Make sure that only one gasket is used.

3. Place the bracket onto the card until the screw holes line up.

Note: Do not force the bracket onto the card. You may have to gently push the LEDs using a small screwdriver to align the LEDs with the holes in the bracket.

4. Using the screws and washers saved from the procedure above step 1. place the screws and washers into the holes and screw them in snug.

Figure 12: Placing the Bracket on the Card



5. Make sure that the LEDs are aligned onto the bracket holes.
6. Use a torque driver to apply up to 2 lbs-in torque on the screws.

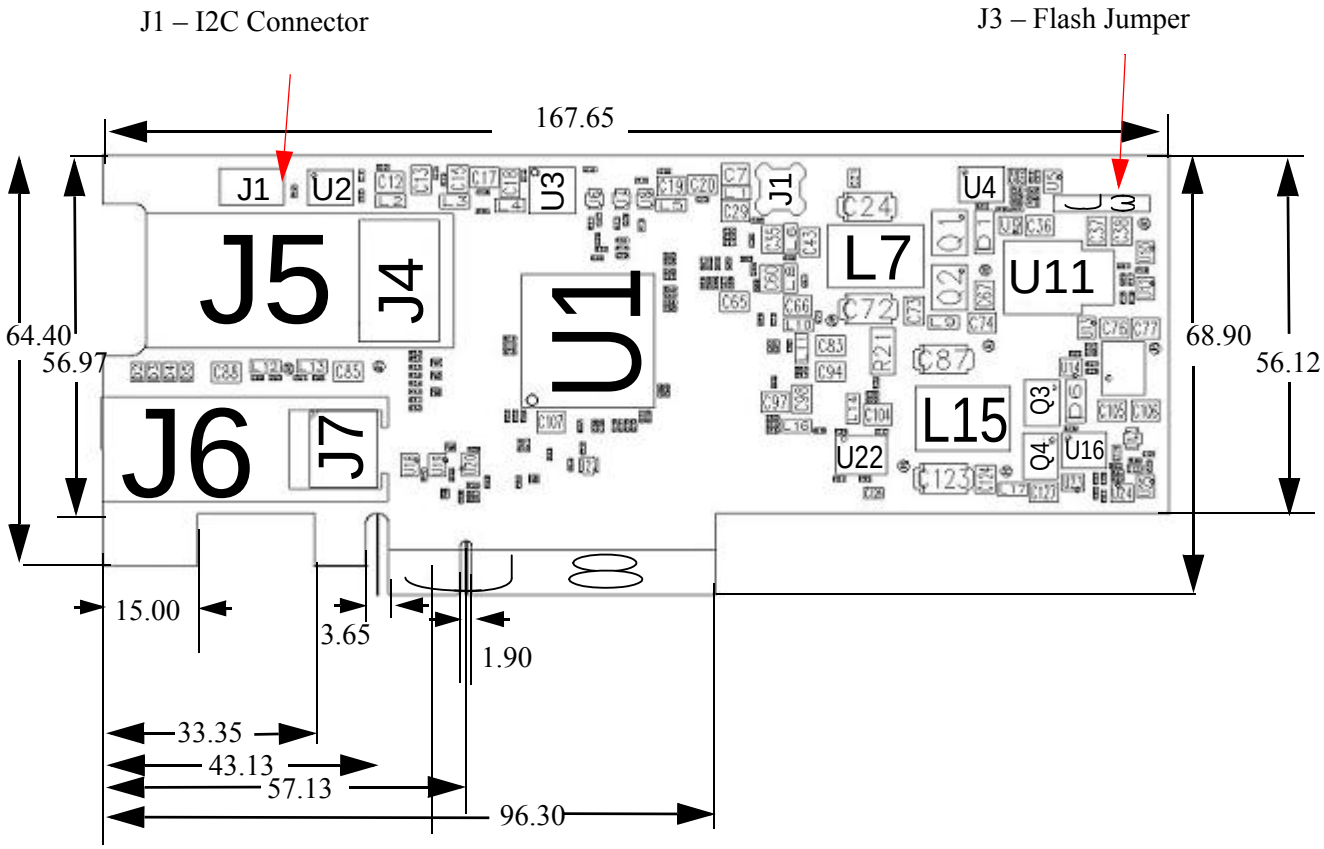
Appendix A: Specifications

A.1 Board Mechanical Drawing and Dimensions

All of the cards covered in this *User's Manual* have the same mechanical drawing and share the same dimensions as depicted in Figure 13.

Note: All dimensions are in millimeters.

Figure 13: Schematic of the ConnectX-2 MHZH Adapter Card



A.2 EMC Certification Statements

Table 11 lists the approved certification status per adapter card in different regions of the world.

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Table 11 - Adapter Cards Certification Status

HCA Card P/N	FCC Class (USA)	EN Class (Europe)	ICES Class (Canada)	VCCI (Japan)
MHZH29-XSR	A	A	A	A
MHZH29-XTR	A	A	A	A

A.2.1 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.2.2 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.2.3 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.2.4 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。

(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.")

A.3 MHZH29-X[ST]R Specifications

Table 12 - Specifications for MHZH29-XTR

Physical		**Power and Environmental**	
Size:	2.71in. x6.60in. (68.90mm x 167.65mm)	Voltage: Maximum Power:	12V, 3.3V 16.5W plus 3.5W for active cables
Air Flow:	200LFM @55°C	Typ Power:	12.0W for passive cables only 15.5W for active optic modules
QSFP40Gb/s Connector:	InfiniBand (Copper and optical) Max power per port 2.0 W.	Temperature:	0°C to 55°C
SFP+ Connector	Ethernet (Copper and optical) Max power per port 1.5W		
Protocol Support		**Regulatory**	
InfiniBand: Ethernet:	IBTA v1.2.1, Auto-Negotiation (20Gb/s, 5Gb/s) or (10Gb/s, 2.5Gb/s) IEEE Std 802.3ae 10 Gigabit Ethernet IEEE Std 802.3ad Link Aggregation and Failover IEEE Std 802.3x Pause IEEE Std 802.1Q VLAN tags IEEE Std 802.1p Priorities Multicast Jumbo frame support (10KB) 128 MAC/VLAN addresses per port	EMC:	FCC 47 CFR part 15:2006, subpart B, class A ICES-003:2004 Issue 4, class A VCCI V-3/2007.04, class A EN 55022:1998+A1:2000+A2:2003 class A, EN 61000-3-2:2000+A2:2005, EN61000-3-3:1995+A2:2005, EN 55024:1998 + A1:2001+A2:2003 standards, harmonized under EMC Directive 2004/108/EC Article 6(2); AS/NZS 3548
QoS:	8 InfiniBand Virtual Lanes for each port	Environmental:	IEC/EN 60950-1:2001 ETSI EN 300 019-2-2 IEC 60068-2- 64, 29, 32
RDMA Support:	Yes, All Ports	RoHS:	RoHS-R6
Data Rate SFP+ Ethernet:	10 Gb/s		
QSFP InfiniBand:	40 Gb/s		
PCI Express:	2.0 SERDES @ 5.0 GT/s		

Appendix B: Interface Connectors Pinout

B.1 I²C-Compatible Connector Pinout

Figure 7: Compatible Connector Plug and Pinout

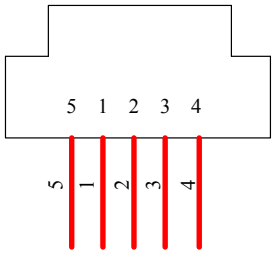


Table 13 - I2C-compatible Connector Pinout

Connector Pin Number	Signal Name
1	SPSDA
2	SPSCL
3	GND
4	NC
5	NC

B.2 PCI Express x8 Connector Pinout

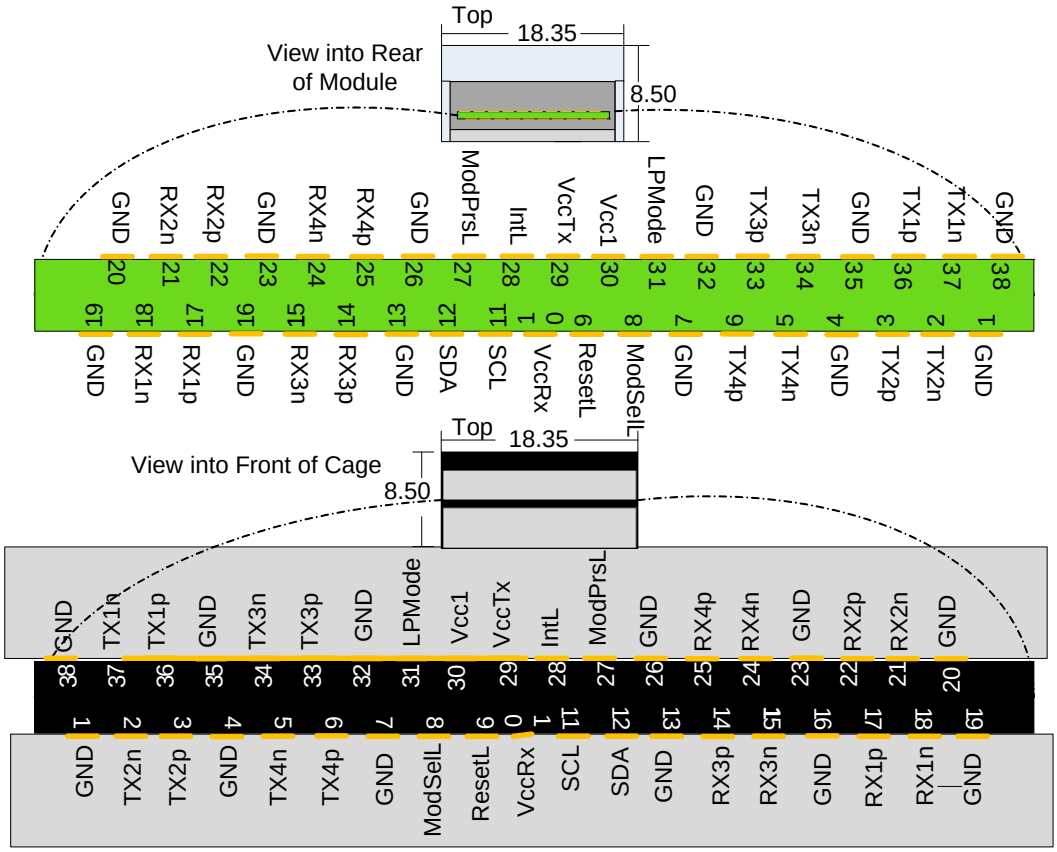
The adapter cards use a standard PCI Express x8 edge connector and the PCI Express x8 standard pinout according to the PCI Express 2.0 specification.

B.3 QSFP Connector Pinout

Table 14 - Connector Pin Name and Number to Signal Name Correspondence

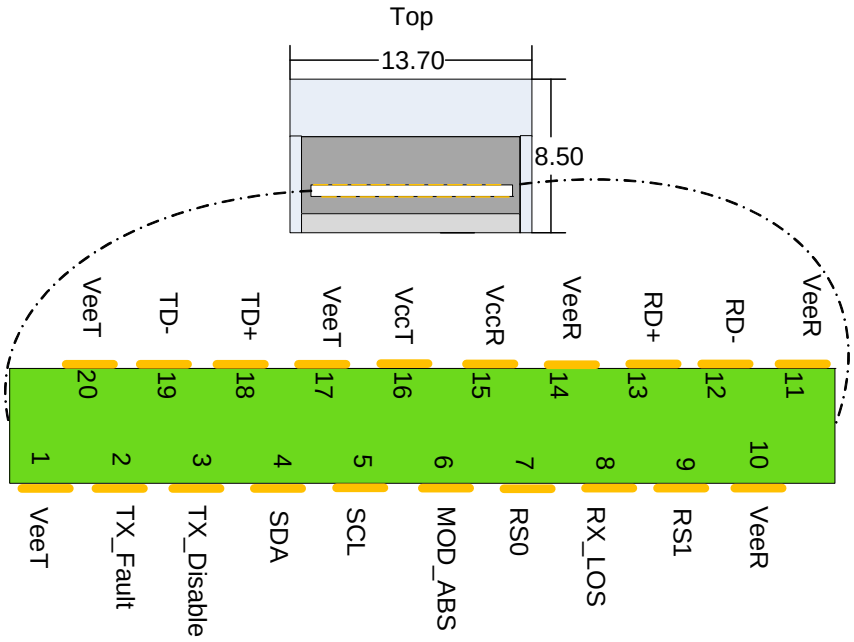
Connector Pin Number	Connector Pin Name	IB Port A Signal Name
1	GND	GND
2	TXN_2	Tx2n
3	TXP_2	Tx2p
4	GND	GND
5	TXN_4	Tx4n
6	TXP_4	Tx4p
7	GND	GND
8	ModSelL_Port0	ModSelL
9	ResetL_Port0	ResetL
10		VccRx
11	SCL	SCL
12	SDA	SDA
13	GND	GND
14	RXP_3	Rx3p
15	RXN_3	Rx3n
16	GND	GND
17	RXP_1	Rx1p
18	RXN_1	Rx1n
19	GND	GND
20	GND	GND
21	RXN_2	Rx2n
22	RXP_2	Rx2p
23	GND	GND
24	RXN_4	Rx4n
25	RXP_4	Rx4p
26	GND	GND
27	ModPrsl_Port0	Mod PrsL
28	IntL	IntL
29		VccTx
30		Vcc1
31	LPMode_Port0	LPMode
32	GND	GND
33	TXP_3	Tx3p
34	TXN_3	Tx3n
35	GND	GND
36	TXP_1	Tx1p
37	TXN_1	Tx1n
38	GND	GND

Figure 14: Connector and Cage Views



B.4 SFP+ Connector Pinout

Figure 15: Rear View of Module With Pin Placement



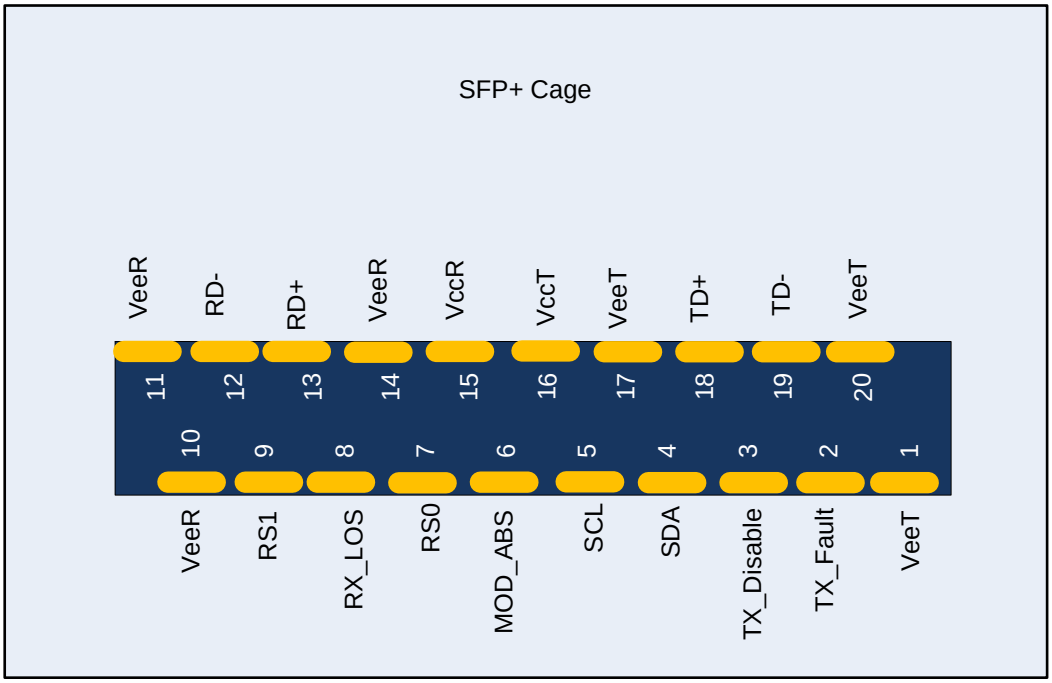


Table 15 - SFP+ Connector Pinout

Pin	Symbol Name	Description
1	VeeT	Transmitter Ground (Common with Receiver Ground) [a]
2	TX_Fault	Transmitter Fault.[b]
3	TX_Disable	Transmitter Disable. Laser output disabled on high or open. [c]
4	SDA	2-wire Serial Interface Data Line [d]
5	SCL	2-wire Serial Interface Clock Line [d]
6	MOD_ABS	Module Absent. Grounded within the module [d]
7	RS0	No connection required
8	RX_LOS	Loss of Signal indication. Logic 0 indicates normal operation. [e]
9	RS1	No connection required
10	VeeR	Receiver Ground (Common with Transmitter Ground) [a]
11	VeeR	Receiver Ground (Common with Transmitter Ground)[a]
12	RD-	Receiver Inverted DATA out. AC Coupled
13	RD+	Receiver Non-inverted DATA out. AC Coupled
14	VeeR	Receiver Ground (Common with Transmitter Ground) [a]
15	VccR	Receiver Power Supply
16	VccT	Transmitter Power Supply
17	VeeT	Transmitter Ground (Common with Receiver Ground) [a]
18	TD+	Transmitter Non-Inverted DATA in. AC Coupled.
19	TD-	Transmitter Inverted DATA in. AC Coupled.
20	VeeT	Transmitter Ground (Common with Receiver Ground)[a]

a. Circuit ground is internally isolated from chassis ground.
b. T_{FAULT} is an open collector/drain output, which should be pulled up with a 4.7k – 10k Ohms resistor on the host board if intended for use. Pull up voltage should be between 2.0V to Vcc + 0.3V. A high output indicates a transmitter fault caused by either the TX bias current or the TX output power exceeding the preset alarm thresholds. A low output indicates normal operation. In the low state, the output is pulled to <0.8V.
c. Laser output disabled on TDIS >2.0V or open, enabled on TDIS <0.8V
d. Should be pulled up with 4.7kΩ – 10kΩ on host board to a voltage between 2.0V and 3.6V. MOD_ABS pulls line low to indicate module is plugged in.
e. LOS is open collector output. Should be pulled up with 4.7kΩ – 10kΩ on host board to a voltage between 2.0V and 3.6V. Logic 0 indicates normal operation; logic 1 indicates loss of signal.

Appendix C: Avertissements de sécurité d'installation (Warnings in 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 55°C (131°F). Un flux d'air de 200LFM à cette température ambiante maximale est nécessaire. 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. Orages – dangers électriques

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

4. 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.

5. Installation du matériel

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

6. Elimination du matériel

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

7. Codes électriques locaux et nationaux

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

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

8. Exposition au rayonnement grave

Mise en garde – l'utilisation de commandes ou de réglages ou l'exécution de procédures autres que ce qui est spécifié dans les présentes peut engendrer une exposition au rayonnement grave.

PRODUIT LASER DE CLASSE 1 » et références aux normes laser les plus récentes CEI 60 825-1:1993 + A1:1997 + A2:2001 et NE 60825-1:1994+A1:1996+ A2:2001

Appendix D: Sicherheitshinweise (Warnings in 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 °C (°F) betrieben werden. Es ist ein Luftstrom von 200 LFM bei maximaler Umgebungstemperatur erforderlich. Außerdem sollten mindestens 8 cm (3 in.) Freiraum um die Belüftungsöffnungen sein, um einen einwandfreien Luftstrom zu gewährleisten.

3. Bei Gewitter - Elektrische Gefahr

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

4. 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.

5. Geräteinstallation

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

6. Geräteentsorgung

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

7. Regionale und nationale elektrische Bestimmungen

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

8. Strahlenkontakt

Achtung – Nutzung von Steuerungen oder Einstellungen oder Ausführung von Prozeduren, die hier nicht spezifiziert sind, kann zu gefährlichem Strahlenkontakt führen..

Klasse 1 Laserprodukt und Referenzen zu den aktuellsten Lasterstandards : ICE 60 825-1:1993 + A1:1997 + A2:2001 und EN 60825-1:1994+A1:1996+ A2:2001