Dolphin PCI Express MXH832 Adapter
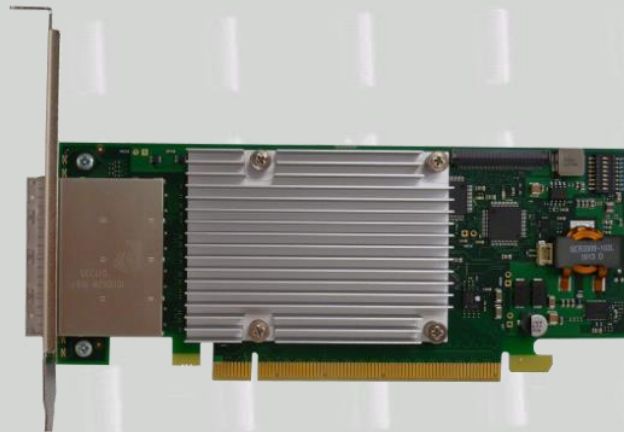
MXH832 Transparent Adapter Users Guide
Version 1.8

Date: 30th November 2023

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PCI Express External Cabling specification 3.0 is, as of the release of MXH832, not completed and ratified by the PCI-SIG. The MXH832 is designed to the new specification, but Dolphin cannot guarantee the card will be compliant to the final 3.0 version. Dolphin firmware tools can update the CMI implementation.

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Scope
This version of the MXH832 Users Guide is valid for firmware version 12.

Terms and acronyms

Important terms and acronyms used in this manual

AOC   Active Optical Cable. PCIe fiber cable assembly available from Dolphin.

CMI   Cable Management Interface. The 2-wire management interface for communication between subsystems
                    connected by a PCIe 3.0 cable. Details can be found in the PCI-SIG External Cabling Specification 3.0.

CMI Controller   Microcontroller on the MXH832 used to manage and implement the CMI communications.

eXpressWare   Dolphin's software stack for PCIe clustering and IO. Please visit www.dolphinics.com for more information.

Host mode   The card is installed in a root complex / Host PC.

Lane   One PCI Express Lane contains a differential pair for transmission and a differential pair for reception.

Link   A collection of one or more PCI Express Lanes providing the communication path between an Upstream
                    and Downstream Port.

MiniSAS-HD   Standard cable without CMI support.

PCIe 3.0 cable   Cable compliant to the preliminary PCI-SIG External Cabling Specification 3.0. Support for CMI.

Port   PCIe Cable port. The MXH832 has four x4 ports, named P1, P2, P3, P4. These ports can be merged to two
                    x8 ports, or one x16 port. The physical ports are identified by text on the PCIe brackets.

Target mode   The card is installed in an expansion chassis

Wake   A mechanism used by a downstream device to request the reapplication of main power when in the L2
                    Link state.

MXH832 High Level Specification

The MXH832 is a low profile, half-length PCIe adapter that can be configured as a Transparent Host Adapter card or a Target adapter card. Once installed in any server's or PC's PCI Express compliant slot, a MXH832 can connect to another MXH832 configured for Transparent Target operation or any target device compliant to the PCI Express External Cabling Specification 3.0. The MXH832 configured as a Transparent Target card can be installed in a PCI Express compliant expansion upstream slot. Please contact Dolphin for a list of compliant expansion chassis. The MXH832 supports PCIe Gen1, Gen2 and Gen3 speeds and x1, x2, x4, x8 and x16 link-widths. The card will operate at the highest common speed shared between the slot and the card (Gen3) and the widest common link-width (x16).

- PCI Express Base Specification, Rev. 3.1.
- PCI Express CEM Specification, Rev. 3.0.
- PCI Express External Cabling specification 3.0
- PCI Express Gen3 8.0 GT/s per lane signaling – 128 GT/s total signaling.
- PCI Express Gen3 x16 edge connector. The card installs in any PCI Express slot that has a physical x16 connector.
- Compliant with PCI Express Gen1 through Gen3 computers and IO systems, auto detection.
- The MXH832 supports transparent connections to IO systems (Host and Target operation).
- Quad SFF-8644 cable connector
  - Durability max total 250 mating cycles
- Cable port configurations, up to
  - One x16
  - Two x8
  - Four x4
- Microsemi Switchtec PM8532 PFX PCI Express Gen3 chipset.
- 170 nanosecond cut-through latency port to port.
- Support for MiniSAS-HD copper cables between MXH832 cards.
- Support for MiniSAS-HD copper cables and PCI Express 3.0 copper cables with CMI.
- Limited support for active optical fibers / AOC.
- Low profile, Half-length - PCI Express Electromechanical Specification, Rev 3.0.
- Dimensions are 167.65mm (6.600 inches) x 68.90 mm (2.731 inches)
- Comes with both a low profile and a standard profile PCI Express bracket.
- Host clock isolation. Automatic support for host running CFC or SSC mode.
- Prepared for SRIS.
- VAUX powered board management controllers for flexible configuration and cable management.
- Flash recovery option. PFX Multi configuration support.
- Power consumption:
  - 12 Volt: Max 19.6 Watts without AOC attached.
  - 12 Volt: Max 26 Watts with 4 AOCs attached
  - +3.3 Volt: Not connected
  - +3.3 Volt AUX: 1 W
- Port power supply (per cable port): 3.3 Volt +/- 5%, 0.6 A
- Operating Temperature: 0°C - 55°C (32°F - 131°F), Air Flow: 150 LFM
- Operating Temperature with AOC: 0°C - 45°C (32°F - 113°F), Air Flow: 150 LFM
- Operating Temperature: 0°C - 50°C (32°F - 122°F), Air Flow: ~0 LFM
- Relative Humidity: 5% - 95% (non- condensing)
- Regulatory:
  - CE
  - EN-55032, EN 55024, Class A.
  - RoHS
  - FCC 15 Subpart B Class A.
  - WEEE
  - Pending Korean KC mark

MXH833

The MXH833 is a special version of the MXH832 modified to interface to a range of Expansion systems available from One Stop Systems. The MXH833 must only be used as a target card and in combination with these systems. The MXH833 can be used in combination with the MXH832 host card. Please contact Dolphin for more information.

MTBF by Temperature and Environment

The MTBF (in hours) for the MXH832 can be found in the table below. The numbers are calculated using the Telcordia SR-332 issue 2 (2006) standard.

Ambient Temp [°C]	Environment		
	Ground fixed, controlled	Ground fixed, uncontrolled	Ground mobile
0	4.712.469	2.356.234	785.411
5	3.982.763	1.991.381	663.794
10	3.330.436	1.665.218	555.073
15	2.757.274	1.378.637	459.546
20	2.262.060	1.131.030	377.010
25	1.840.861	920.431	306.810
30	1.487.703	743.852	247.951
35	1.195.319	597.659	199.220
40	955.879	477.940	159.313
45	761.601	380.801	126.934
50	605.162	302.581	100.860
55	479.963	239.982	79.994

Table 1 : MTBF vs. Temperature and Environment

Packaging

The MXH832 includes the following components.
- MXH832 Adapter Board
- Low profile bracket
- Anti-static bag
- Getting started guide

Pre-Installation Questions

Certain steps should be taken prior to installing the MXH832. You should determine the following configuration requirements.
- Which PCIe slot and system will the card be installed in?
- Will the board act as a host adapter or target adapter?
- What is the speed and link width of the slot that the card will be installed in?
- What is the operating environment in which the card will be installed?
- What type and length of cables will be used?
- How to establish proper operational conditions, temperature and air-flow.

PCIe Slot Determination

The MXH832 supports PCIe Gen1, Gen2 and Gen3 speeds and x1, x2, x4, x8 and x16 link-widths. The slot width and speed will affect the performance of the card. The card can be physically installed in a x4, x8 or x16 connector. The card will auto configure to the slot speed and width.

MXH832 Host / Target Configuration

The MXH832 can act as either a host adapter or target adapter. The MXH832 has a DIP switch bank to control these functions. The DIP switch labeled SW1 can be found close to the upper edge of the board. The main configuration options are host or target operations . The default DIP switch setting is transparent host x16 operations. Additional settings are target operations, two x8 links, four x4 links, alternativce edge clock routing and quad edge target.

Operating Environment

To maximize lifetime for the product and maintain the warranty, please honor the specified operating temperature and make sure the specified air flow is present. Special care should be considered when the MXH832 is used in office type cabinets in combination with other high energy consuming PCIe devices, e.g. not active-cooled GPUs:

> Operating Temperature: 0°C - 55°C (32°F - 131°F), Air Flow: 150 LFM
> Operating Temperature with AOC: 0°C - 45°C (32°F - 113°F), Air Flow: 150 LFM
> Operating Temperature: 0°C - 50°C (32°F - 122°F), Air Flow: ~0 LFM
> Relative Humidity: 5% - 95% (non-condensing)

Cable Connections

The MXH832 is designed to support both long and short copper cables. The default configuration supports cables between 0.5 and 9 meters or fiber cables. If you are connecting the MXH832 to a compliant target device not designed by Dolphin, other settings or limitations may apply. Limited support for AOCs. For max AOC performance, please consider the MXH932 or PXH832.

The MXH832 cable connector is compliant to the SFF-8644 industry specification and supports standard x4/x8 Mini-SAS HD cables or x4/x8 PCI Express 3.0 cables compliant to the PCIe External Cabling Specification 3.0. Four x4 or two x8 cables are needed for full PCIe x16 connectivity.

PCI Express 3.0 Cables
When used with cables compliant to the new PCIe External Cable standard 3.0, the MXH832 card will transmit a CMI Reset message downstream and supports upstream CMI_WAKE. The card can be connected to a MXH832 in Target mode or any PCIe device compliant to the new cable standard.

MiniSAS-HD Cables
When used with standard MiniSAS-HD cables that does not support the new CMI functionality, the onboard CPU will synthetize a PCIe #CPERST and forward it to the downstream MXH832 card. WAKE and POWERON is not supported using standard MiniSAS-HD cables.

Active Optical Cables (AOC)
The MXH832 card is compliant with PCIe active fiber optic cables up to 100 meters. Long distance fiber optics will reduce general throughput. For long distance high throughput applications, the MXH932, MXH942, MXH952 or PXH832 product lines are recommended. Please contact more Dolphin for more information. WAKE and POWERON is not supported using standard AOC cables.

CMI Functionality

The 8.4 firmware release supports the following CMI operations:

- Publishes card and CMI status information in readable memory map
- Supports sending and receiving CMI reset, wake and power status messages
- Supports receiving indicators (LED/messages).

Installation

Step 1 - Unpack board

The MXH832 card is shipped in an anti-static bag to prevent static electricity damage. The card should only be removed from the bag after ensuring that anti-static precautions are taken. Static electricity from your clothes or work environment can damage your PCI Express adapter card or your PC. Always wear a grounded anti-static wrist strap while opening the PC and when the MXH832 is removed from the anti-static bag.
Unpack the MXH832 from the anti-static bag using proper anti-static procedures.

Step 2 - Change PCIe Bracket if necessary

The MXH832 package includes a standard and low-profile PCI Express bracket. By default, the standard height bracket is installed on the board. If you need to replace the mounted bracket with a low-profile bracket, carefully unscrew the two mounting screws to remove the full height bracket. Save the two mounting screws and replace the bracket with the low-profile bracket. Use the two mounting screws to install the low-profile bracket. The screws should be carefully tightened, but be careful not to over-tighten. Make sure you are properly grounded to avoid static discharges that may destroy the adapter card before performing this procedure.

Step 3 - Configure the Board for Proper Operation

Set the DIP switch settings for proper operation depends on the firmware. Please refer to the section Configuration and DIP Switches on page 11 for details.

Step 4 - Install the Adapter Card

Before installing the adapter card, make sure you are properly grounded to avoid static discharges that may destroy your computer or the adapter card. Ensure you are properly grounded before opening your computer or the anti-static bag containing the MXH832. Please follow your computer's or expansion chassis manual on how to install a PCI Express card.
The MXH832 Adapter card can be installed into any PCI Express x16 slot. The MXH832 supports PCI Express Gen1, Gen2 and Gen3 signaling. NOTE: A Gen3 slot is recommended as it typically doubles the performance compared to a Gen2 slot. The MXH832 is an x16 card, so maximum performance will only be attained if the slot provides full electrical x16 signaling.
The MXH832 supports hosts using either spread spectrum or constant frequency clocking. The card implements clock isolation.

Step 5 - Installing and Removing the Cable

Installing and removing cables should be done with both host and expansion system powered off. Please contact your Dolphin representative if you intend to continuously connect and disconnect the PCI Express cables.

Connecting the Cable

Please carefully install the cable connector into the connector housing on the MXH832 adapter card. Cable port 1 is located at the top of the PCIe bracket, ref Figure 1 PCIe Bracket to the right. To install the cable, match the cable house with the connector on the MXH832 adapter card. Use even pressure to insert the connector until it is secure. Adhere to ESD guidelines when installing the cables to ensure you don't damage the board. Computer cables should always use strain relief to protect the connected equipment from excessive force on the cable. This is especially important for cables between racks. Note that for wider than x4 connections, the same cable-ports (ie port 1 through 4) should be used on both host and target for each individual cable, to ensure that the cards properly link up as x8 or x16.
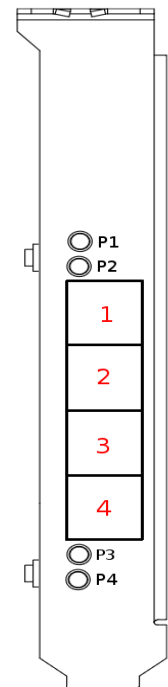

Figure 1 PCIe Bracket

Supported cable lengths

The MXH832 supports both copper and active optical cables (AOC). Max lengths can be found in Table 2 below. The max distance may change when connecting to other PCIe products.

Cable	Speed	Distance
Copper MiniSAS-HD	Gen3	9 meters

Copper MiniSAS-HD	Gen1	12 meters
Copper PCIe 3.0 cable	Gen3	5 meters
Fiber optic (AOC)	Gen3	100 meters - Contact Dolphin for performance

<div align="center">**Table 2: Cable Specifications**</div>

Disconnecting the Cable

Please carefully pull the release tab to release the cable from the locking latches and gently pull the cable out of the connector guides.

Step 6 - Verify Installation & LEDs

The MXH832 comes with 4 bi-color LEDs which show the corresponding cable port status according to Table 3: LED below.

The LEDs are visible through cut-outs in the PCIe bracket on each side of the cable connector block.

LED color	Function
Off	No cable installed
Yellow	Cable installed, no link
Green	Cable installed, link gen 3
Green blinking	Cable installed, link gen 1/2

<div align="center">**Table 3: LED behavior**</div>

Operation

Configuration and DIP Switches

The MXH832 has one bank of 8 DIP switches. The default factory setting for the MXH832 is Transparent Host mode, single (up to x16) link connection.
The MXH832 has DIP switches for setting special modes or operations, the meaning of each DIP switch depends on the loaded firmware. Please carefully read the documentation shipped with the card before modifying any DIP switch settings. Please pay close attention to ON and OFF positions written on the DIP switch.
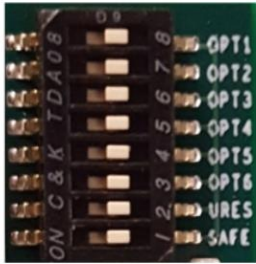
DIP Switches

Figure 2: DIP Switch shows the DIP switch for the MXH832. It is used to configure the adapter card. Please leave all undocumented DIP switches in the default position. Table 4: DIP Switch settings shows all the various DIP switch settings for the MXH832.

Figure 2: DIP Switch

DIP no.	Name	Description	ON	OFF	Default
1-5	OPT1-5	Configuration selector, details below			OFF
6	OPT6	CMI Disable	Will disable the CMI functionality.	CMI will be used if a PCIe 3.0 cable is detected	OFF
7	URES	Holds the management processors in reset	Board management is held in reset	Normal operation	OFF
8	SAFE	Enables the card to boot if the EEPROM has been corrupted	Safe EEPROM	Normal operation	OFF

Table 4: DIP Switch settings

Note: DIP switch configuration options may be changed in the future versions. Please always consult the latest user guide for details. The table above is valid for version 12.

Target Card Clocking Option

When the card is used in Transparent Target configuration, the default configuration settings will enable the card to provide a reference clock on the edge connector pins 13A + 14A. To enable compatibility with some expansion backplanes, the card can also optionally provide the reference clock on edge connector pins 6A + 7A. Please consult your backplane vendor to determine the backplane requirements.

DIP switch Settings

DIP Switch settings for MXH832 Host operation

The following DIP Switch settings should be considered when configuring the **MXH832 for Transparent Host** operation:

Use Case	Configuration MXH832 Host	DIP ON	DIP switch view
A+D	Transparent Host One x16 downstream port (P1+P2+P3+P4)	(all off) (Shipping Default)	
B	Transparent Host Two x8 downstream ports (P1+P2, P3+P4)	OPT-1	
C	Transparent Host Four x4 downstream ports (P1,P2,P3,P4)	OPT-2	

DIP Switch settings for MXH832 Target operation

The following DIP Switch settings should be considered when configuring the **MXH832 for Transparent Target** operation:

Use Case	Configuration MXH832 Target	DIP ON	DIP switch view
A	Transparent Target One x16 upstream port (P1+P2+P3+P4) One x16 downstream port	OPT-1 OPT-2	
B	Transparent Target One x8 upstream port (P1+P2) One x16 downstream port	OPT-1 OPT-2	
C	Transparent Target One x4 upstream port (P1 or P4) One x16 downstream port	OPT-1 OPT-2	

Transparent Use Cases

The MXH832 card may be used as both a Host card and a Target card. A Host and Target card can be used as a pair or the Host card can be used with a compliant Target device. The supported use cases and the DIP switch settings are summarized in section Configuration and DIP Switches on page 11.

Use Case A - 1 Host – Single Expansion Configuration PCIe x16

The Host system has a MXH832 adapter configured for Host operation and a direct x16 link to a MXH832 configured for Target operation. If you only need a x8 or x4 link, please configure according to use case B or C.
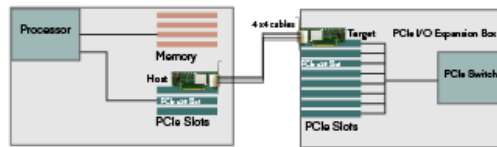
Figure 3: Use Case A

Host card ports	Target card ports
P1	P1
P2	P2
P3	P3
P4	P4

Table 5: Required x16 cabling

Always connect a cable from Port #x to Port #x
A failure connecting any of the cables will cause the link to re-train to x8 or x4.

Use Case B – 1 Host – Single or Dual Expansion Configuration – PCIe x8

The host has a MXH832 adapter configured for Transparent Host operation and a direct x8 link is used to connect one or two   independent downstream target systems.
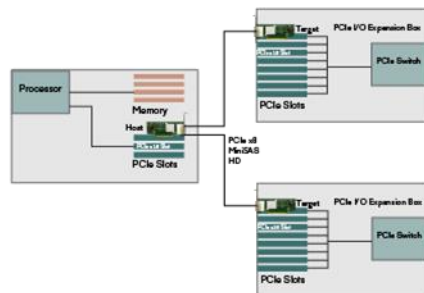
Host card ports	Target card 1 ports	Target card 2 ports
P1	P1	
P2	P2	
P3		P1
P4		P2

Table 6: Required x8 cabling

Use Case C – 1 Host - Quad Expansion Configuration – PCIe x4

The host has a MXH832 adapter configured for Transparent Host operation and 1-4 direct x4 links is used to connect 1-4 independent downstream target systems.
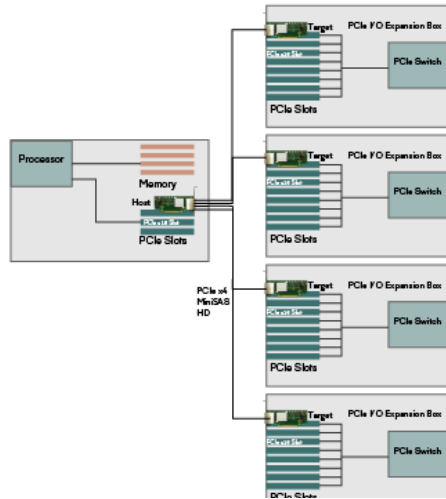
Figure 4: Use Case C

Host card ports	Target card 1 port	Target card 2 port	Target card 3 port	Target card 4 port
P1	P1			
P2		P1		
P3			P1	
P4				P1

Table 7: Required x4 cabling

Use Case D – 1 Host – Transparent fan-out using MXS824 - PCIe x16

The MXH832 is compliant to the MXS824 24 port PCIe switch. The switch enables large-scale Transparent PCIe fanout to hundreds of PCIe devices. Please find more details in the MXS824 Users Guide.
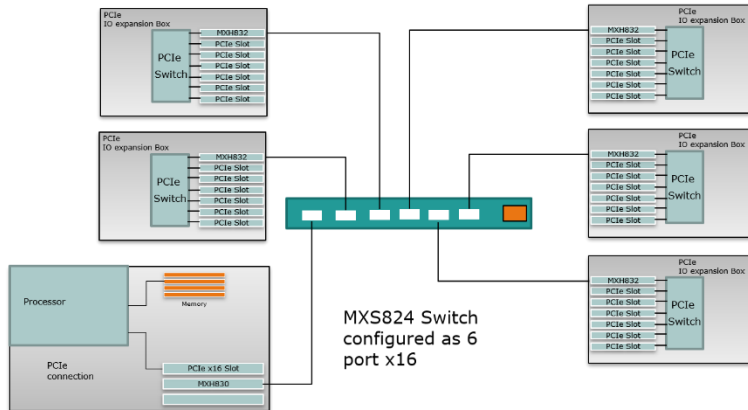
EEPROM and Firmware Upgrade

The MXH832 design uses a microcontroller (BMC) to implement the PCIe CMI protocol and other maintenance functions. Dolphin may from time to time publish updated firmware for the microcontroller, PFX Flash or EEPROM data for the card. Please consult the MXH832 Adapter Firmware Release Note for instructions on how to upgrade the MXH832. Please note that standard Microsemi firmware tools cannot be used to upgrade the firmware.

Identifying the Card

The card has a label-sticker with the serial number in the format 'MXH832-YY-ZZZZZZ', where YY denotes the card revision (e.g. BB) and ZZZZZZ denotes the serialized production number (e.g. 012345) – this whole string makes up the serial number of the card (i.e. MXH832-BB-012345).

You can also get this information using lspci in Linux:

First, identify the devices for the Dolphin Host card:

```
# lspci | grep "Device 8532"

01:00.0 PCI bridge: PMC-Sierra Inc. Device 8532
01:00.1 Memory controller: PMC-Sierra Inc. Device 8532
02:00.0 PCI bridge: PMC-Sierra Inc. Device 8532
```

Then run lspci and identify the card. It will show up as something like

```
# lspci -s 1:0.0 -v
01:00.0 PCI bridge: PMC-Sierra Inc. Device 8532 (prog-if 00 [Normal decode])
        Flags: bus master, fast devsel, latency 0, IRQ 25
        Bus: primary=01, secondary=02, subordinate=03, sec-latency=0
        I/O behind bridge: 00002000-00002fff
        Prefetchable memory behind bridge: 00000000df200000-00000000df3fffff
        Capabilities: [40] Express Upstream Port, MSI 00
        Capabilities: [7c] MSI: Enable+ Count=1/8 Maskable- 64bit+
        Capabilities: [8c] Power Management version 3
        Capabilities: [94] Subsystem: Dolphin Interconnect Solutions AS Device 0832
        Capabilities: [100] Advanced Error Reporting
        Capabilities: [138] Power Budgeting <?>
        Capabilities: [148] #12
        Capabilities: [178] #19
        Capabilities: [1a4] Device Serial Number 00-00-42-42-00-00-00-ff
        Capabilities: [1b0] Latency Tolerance Reporting
        Capabilities: [1b8] Access Control Services
        Capabilities: [7f8] Vendor Specific Information: ID=ffff Rev=1 Len=808 <?>
        Kernel driver in use: pcieport
        Kernel modules: shpchp
# lspci -s 1:0.1 -v
01:00.1 Memory controller: PMC-Sierra Inc. Device 8532
        Subsystem: Dolphin Interconnect Solutions AS Device 0832
        Flags: bus master, fast devsel, latency 0
        Memory at f7800000 (64-bit, non-prefetchable) [size=4M]
        Capabilities: [40] MSI: Enable- Count=1/4 Maskable- 64bit+
        Capabilities: [50] MSI-X: Enable- Count=4 Masked-
        Capabilities: [5c] Power Management version 3
        Capabilities: [64] Express Endpoint, MSI 00
        Capabilities: [100] Advanced Error Reporting
        Capabilities: [138] Device Serial Number 00-00-42-42-00-00-00-ff
        Capabilities: [144] Access Control Services
# lspci -s 2:0.0 -v
02:00.0 PCI bridge: PMC-Sierra Inc. Device 8532 (prog-if 00 [Normal decode])
        Flags: bus master, fast devsel, latency 0, IRQ 26
        Bus: primary=02, secondary=03, subordinate=03, sec-latency=0
        I/O behind bridge: 00002000-00002fff
        Prefetchable memory behind bridge: 00000000df200000-00000000df3fffff
        Capabilities: [40] Express Downstream Port (Slot+), MSI 00
        Capabilities: [7c] MSI: Enable+ Count=1/8 Maskable- 64bit+
        Capabilities: [8c] Power Management version 3
        Capabilities: [94] Subsystem: Dolphin Interconnect Solutions AS Device 0832
        Capabilities: [100] Advanced Error Reporting
        Capabilities: [138] Power Budgeting <?>
        Capabilities: [148] #12
        Capabilities: [178] #19
        Capabilities: [1a4] Device Serial Number 00-00-42-42-00-00-00-ff
        Capabilities: [1b0] Downstream Port Containment
        Capabilities: [1bc] Access Control Services
        Capabilities: [7f8] Vendor Specific Information: ID=ffff Rev=1 Len=808 <?>
        Kernel driver in use: pcieport
        Kernel modules: shpchp
```

Second,
do

```
# lspci -s 1:0.0 -v | grep -E "Subsystem|Serial"
        Capabilities: [a4] Subsystem: Dolphin Interconnect Solutions AS Device 0832
        Capabilities: [100] Device Serial Number 00-00-42-42-00-00-00-ff
```

This shows the card as revision 0x4242 (hexadecimal values of the 'BB' letters in the ASCII table), with the production number 0x000000ff (00000255 in decimal).

Support

More information about the product, support and software download can be found at http://www.dolphinics.com/mx. For general support questions, please contact Dolphin via the Jira Service Management portal: https://www.dolphinics.com/csp.

Technical Information

Board revision history
The following table gives a general overview of the hardware revision history.

Adapter card revision	Capabilities
MXH832-CE	• Initial product version
MXH832-CF	• New improved heat sink with better mounting. • Current shipping version.

Simplified schematics
The figure below shows the MXH832 simplified schematics. Only the main functions are shown.
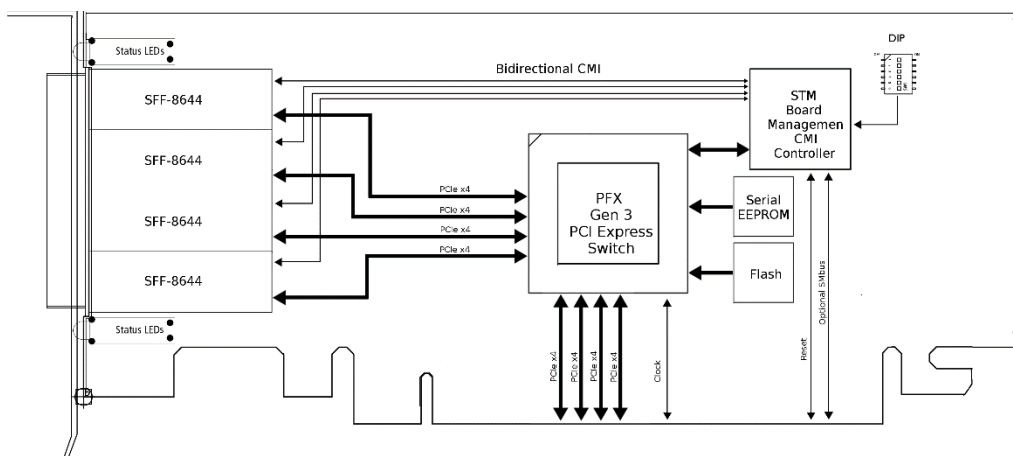

Figure 5: MXH832 Simplified Schematics

PCIe Cable Port Signals

The external PCI Express SFF-8644 cable connector supports the following signals:

- PETpN/PETnN: PCI Express Transmitter pairs, labeled where N is the Lane number (starting with 0); "p" is the true signal while "n" is the complement signal.
- PERpN/PERnN: PCI Express Receiver pairs, labeled where N is the Lane number (starting with 0); "p" is the true signal while "n" is the complement signal.
- PWR: Power to support AOC and signal conditioning components within the cable assembly.
- MGTPWR: Power supplied to the connector for cable management components that are needed while the link is not active. This needs to be active if the subsystem has power.
- CBLPRSNT#: Cable present detect, an active-low signal pulled-down by the cable when it is inserted into the MXH832 connector.
- CADDR: Signal used to configure the upstream cable management device address.
- CINT#: Signal asserted by the cable assembly to indicate a need for service via the CMI controller.
- CMISDA: Management interface data line. Used for both initial link setup and sideband messages when used with CMI compliant cables.
- CMISCL: Management interface clock line. Used for both initial link setup and sideband messages when used with CMI compliant cables.

External PCIe x4 Cable Connector Pin-Out

					Column				
Row	9	8	7	6	5	4	3	2	1
D	GND	PETn2	PETp2	GND	PETn1	PETp1	GND	MGTPWR	PWR
C	GND	PETn3	PETp3	GND	PETn0	PETp0	GND	CMISDA	CMISCL
B	GND	PERn2	PERp2	GND	PERn1	PERp1	GND	CBLPRSNT#	PWR
A	GND	PERn3	PERp3	GND	PERn0	PERp0	GND	CINT#	CADDR

Table 8; External PCIe x4 cable Pin-Out

PCIe Cable Port Mapping

The MXH832 card have a quad SFF-8644 connector. The table below show the signal / port map.

Cable Port	x16	Dual x8	Quad x4	PCIe 3.0 Cable Pin
1	L0 L1 L2 L3	L0 L1 L2 L3	L0 L1 L2 L3	TX0/RX0 TX1/RX1 TX2/RX2 TX3/RX3
2	L4 L5 L6 L7	L4 L5 L6 L7	L0 L1 L2 L3	TX0/RX0 TX1/RX1 TX2/RX2 TX3/RX3
3	L8 L9 L10 L11	L0 L1 L2 L3	L0 L1 L2 L3	TX0/RX0 TX1/RX1 TX2/RX2 TX3/RX3
4	L12 L13 L14 L15	L4 L5 L6 L7	L0 L1 L2 L3	TX0/RX0 TX1/RX1 TX2/RX2 TX3/RX3

Lx – PCIe lane X, Cable port is ref PCIe bracket marking

Table 9 : PCIe Cable Port Mapping

MXH832 PCIe x16 Edge Connector Pin-Out

The MXH832 Edge connector follows PCI Express CEM Specification, Rev. 3.0 section 6 – Card Connector Specification. Signal names are shown in Table 10. In host mode, the MXH832 is PCIe SIG compliant. The signals in **bold** are bi-directional, where the direction depends on if the card is configured for host or target mode. In the case where the MXH832 is configured as a target adapter in an expansion chassis, it will provide a 100 MHz, non-SSC, reference clock on the REFCLK+/REFCLK- pins. The shaded signals TDI and TDO are normally tri-stated, but can be configured to provide an alternative 100 MHz, non-SSC, reference clock for PCIe expansion chassis utilizing these pins instead.

Pin	Side B	Note	Side A	Note
1	+12		PRSNT1#	
2	+12		+12	
3	+12		+12	
4	GND		GND	
5	SMCLK	BMC	TCK	NC
6	SMDAT	BMC	TDI	O Ref clock
7	GND		TDO	O Ref clock
8	+3,3V	PWR	TMS	NC
9	TRST#	NC	+3,3	PWR
10	+3,3V aux	Standby	+3,3	PWR
11	**WAKE#**	Wake up	**PERST#**	Reset
12		NC	GND	
13	GND		**REFCLK+**	Ref clock +
14	PERp0		**REFCLK-**	Ref clock -
15	PERn0		GND	
16	GND		PETp0	
17	PRSNT2#		PETn0	
18	GND		GND	
19	PERp1			NC
20	PERn1		GND	
21	GND		PETp1	
22	GND		PETn1	
23	PERp2		GND	
24	PERn2		GND	
25	GND		PETp2	
26	GND		PETn2	
27	PERp3		GND	
28	PERn3		GND	
29	GND		PETp3	
30		NC	PETn3	
31	PRSNT2#		GND	
32	GND			NC
33	PERp4			NC
34	PERn4		GND	
35	GND		PETp4	
36	GND		PETn4	
37	PERp5		GND	
38	PERn5		GND	
39	GND		PETp5	
40	GND		PETn5	
41	PERp6		GND	
42	PERn6		GND	
43	GND		PETp6	

Pin	Side B	Note	Side A	Note
44	GND		PETn6	
45	PERp7		GND	
46	PERn7		GND	
47	GND		PETp7	
48	PRSSNT2#		PETn7	
49	GND		GND	
50	PERp8		NC	
51	PERn8		GND	
52	GND		PETp8	
53	GND		PETn8	
54	PERp9		GND	
55	PERn9		GND	
56	GND		PETp9	
57	GND		PETn9	
58	PERp10		GND	
59	PERn10		GND	
60	GND		PETp10	
61	GND		PETn10	
62	PERp11		GND	
63	PERn11		GND	
64	GND		PETp11	
65	GND		PETn11	
66	PERp12		GND	
67	PERn12		GND	
68	GND		PETp12	
69	GND		PETn12	
70	PERp13		GND	
71	PERn13		GND	
72	GND		PETp13	
73	GND		PETn13	
74	PERp14		GND	
75	PERn14		GND	
76	GND		PETp14	
77	GND		PETn14	
78	PERp15		GND	
79	PERn15		GND	
80	GND		PETp15	
81	PRSNT2#		PETn15	
82		NC	GND	

Table 10: PCIe Edge Connector Pin-Out

Compliance and Regulatory Testing

EMC Compliance

The Dolphin PCI Express MXH832 adapter is tested to the following relevant test standards for PCI
Express cards, telecommunication and industry equipment installed in a standard PC:

> EN 55032
> EN 55024, Class A

This does not ensure that it will comply with these standards in any random PC. It is the responsibility of the integrator to
ensure that their products are compliant with all regulations where their product will be used.

RoHS Compliance

The Dolphin MXH832 is RoHS compliant. A Compliance certificate issued by the
manufacturer is available upon request.

FCC Class A

This equipment is tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of
the FCC Rules.

Limited Warranty

Dolphin Interconnect Solutions warrants this product to be free from manufacturing defects under the following terms:

Warranty Period

The warranty applies for one (1) year from the date of purchase. Extended warranty is available.

Coverage

To the extent permitted by applicable law, this warranty does not apply to:

- Damage caused by operator error or non-compliance with instructions available for the product.
- Use or attempt to use or program firmware not approved by Dolphin.
- Damage due to accidents, abuse, misuse, improper handling or installation, moisture, corrosive environments, high voltage surges, shipping, or abnormal working conditions.

- Damage resulting from violation of the specified operating or storage temperatures and airflow.
- Damage caused by acts of nature, e.g. floods, storms, fire, or earthquakes.
- Damage caused by any power source out of range or not provided with the product.
- Normal wear and tear.
- Attempts to repair, modify, open, or upgrade the product by personnel or agents not authorized by Dolphin.
- Products for which the serial number label has been tampered with or removed.
- Damage to the product caused by products not supplied by Dolphin.

Service Procedure

In the event that the product proves defective during the Warranty Period, you should contact the seller that supplied you with the product, or if you purchased it directly from Dolphin, visit https://www.dolphinics.com/csp to obtain a valid RMA number and instructions. Products returned to Dolphin without a proper RMA number will not be serviced under this warranty.