Version 5.0 2007

# PEX 8114

## *ExpressLane™ PCI Express-to-PCI/PCI-X Bridge*

### Features

- General Features
  - Forward and Reverse bridging
  - Reverse bridging root functions
  - Transparent bridging
  - Standard 256 Plastic BGA package (17mm x 17mm)
  - Leaded and lead-free ROHS versions available
  - Low power – 2W
  - No heat sink required
  - EEPROM configuration option
  - 1.0 V core supply voltage
  - DC and AC JTAG (1149.1 and 1149.6)
- Scalable PCI Express Interface
  - x4 Link (configurable as x1, x2 or x4)
  - Full-duplex PCI Express lanes; 2.5 Gbps each
  - Automatic lane reversal
  - 8b/10b encoding
  - Link training (auto-negotiate to smallest link width)
  - 256 byte maximum payload size
  - PCI Express Base specification 1.0a compliant
  - End-to-end CRC and data poisoning
  - Advanced error reporting
  - Link and device power management
  - Advanced flow control
  - Hot Plug
  - Turn off unused lanes for power reduction
- Advanced PCI-X Interface
  - PCI-X (v 1.0b): 64 bits at 133, 100 or 66 MHz
  - PCI 3.0: 32 or 64 bits at 66, 50, 33 or 25 MHz
  - 8-outstanding split transactions
  - Internal arbiter supports up to 4 external masters
  - 3.3V I/O
  - Message Signal Interrupt (MSI) support
  - Provides up to four PCI/PCI-X clocks
  - Scratchpad and doorbell registers

PLX TECHNOLOGY
THE I/O INTERCONNECT SOLUTION

### Flexible, High-Performance Bridge in a Small Package

The PLX Technology ExpressLane™ PEX 8114 is a high performance bridge that enables designers to migrate legacy PCI and PCI-X bus interfaces to the new advanced serial PCI Express™ interface. This flexible device supports forward and reverse transparent bridging.

The bridge is equipped with a standard, but flexible PCI Express port that scales to x1, x2 or x4 lanes with a maximum of 1 Gigabyte per second of throughput per transmit and receive direction. With four 2.5 Gbps integrated SerDes, the standard PCI Express signaling delivers the highest bandwidth with the lowest possible pin count using LVDS technology.

The ExpressLane PEX 8114 has a single parallel bus segment supporting the advanced PCI-X protocol, with a 64-bit wide parallel data path running at 133MHz. The bridge also supports conventional PCI operation.

While both sides of the bridge are evenly matched, the device also supports internal queues with flow control features to optimize throughput and traffic flow.

The small 17mm x 17mm footprint in standard Plastic BGA packaging makes the ExpressLane PEX 8114 ideal for a variety of applications where board real estate is at a premium. Leaded and lead-free ROHS versions are available.

### Forward and Reverse Bridging

Compliant to the PCI Express-to-PCI/PCI-X Bridge Specification 1.0, the ExpressLane PEX 8114 is capable of operating in either forward or reverse bridging modes. In forward mode, the bridge allows legacy PCI or PCI-X chips and adapters to be used with new PCI Express processor systems. Reverse bridge operation allows conventional PCI or PCI-X processors and chipsets to configure and control advanced PCI Express switches and endpoints. The reverse bridge not only allows complete configuration of a downstream PCI Express system from the PCI/PCI-X bus, but it also handles limited PCI Express root functions for reverse interrupt and advanced error handling.

### High Performance PCI Express Interface

The fully integrated PCI Express interface incorporates many of the advanced protocol features in PCI Express such as Automatic Lane Reversal, ECRC, Data Poisoning, Link State Power Management and Hot Plug. The single link scales from x4 to x2 or x1 operation through configuration or automatic link training. This enables the user to reduce power consumption by turning off unused lanes.

## Board and System Design Applications

The ExpressLane PEX 8114 can be used on PCI Express-based motherboards or embedded systems to connect legacy PCI or PCI-X slots or devices. In addition, the bridge can be used in add-on cards and mezzanine boards in either forward or reverse bridge mode.

### *Motherboards*

The simple design and small footprint of the ExpressLane PEX 8114 make it an ideal bridge solution for the motherboard (see Figure 1), providing for PCI or PCI-X slot connectivity and for interface to legacy native PCI or PCI-X silicon I/O components.

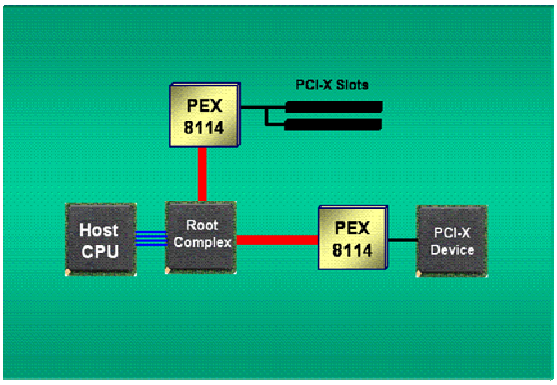


**Figure 1. Forward Bridge on Motherboard**

In addition, the ExpressLane PEX 8114 is ideal for enabling PCI Express slot connectivity on motherboards with existing PCI or PCI-X chipsets (see Figure 2). The reverse bridge function including reverse bridge root registers means customers can upgrade existing designs without changing their choice of CPU chipset.

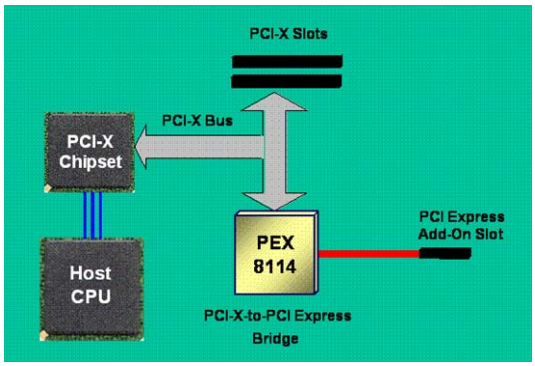


**Figure 2. Reverse Bridge on Motherboard**

### *Adapter Boards-Forward Bridge*

In *Forward Mode* (see Figure 3), the ExpressLane PEX 8114 can be used to quickly upgrade legacy PCI or PCI-X adapter board designs to be compatible with PCI Express standard interface slots.

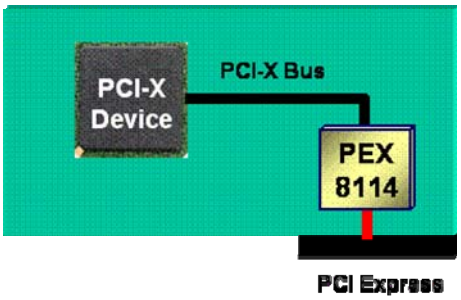


**Figure 3. Forward Mode**

### *Adapter Boards-Reverse Bridge*

The ExpressLane PEX 8114 supports *Reverse Mode* bridging (see Figure 5), enabling state-of-the-art PCI Express silicon to be used with legacy PCI or PCI-X parallel busses. Designers can utilize the latest LAN, SAN or NAS I/O silicon architectures and features while providing the capability to bridge backwards to widely entrenched legacy slots and backplanes. Reverse bridging allows the host processor to reside out on the PCI or PCI-X bus; the bridge will accept configuration cycles from the PCI/PCI-X side and manage the local PCI Express interface as a secondary entity within the PCI software model.

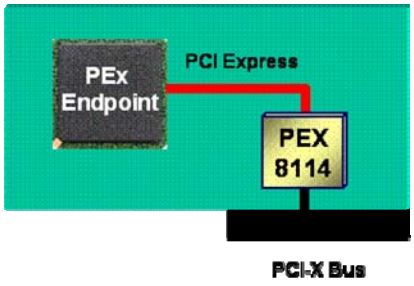


**Figure 5. Reverse Mode**

### *Mezzanine Cards*

The small footprint and low power of the ExpressLane PEX 8114 make it ideal for use in mezzanine products based on the latest PICMG standards for PCI Express (see Figure 6).

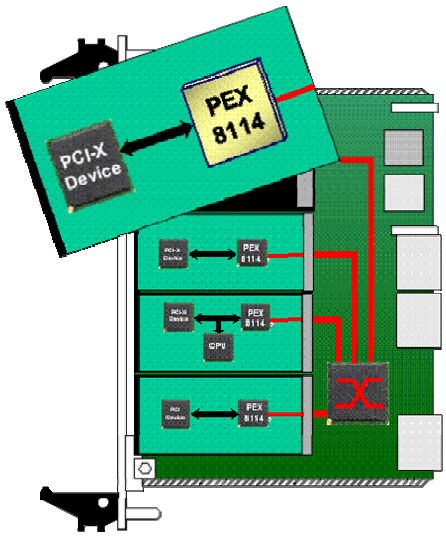


**Figure 6. Advanced Mezzanine Card and Carrier**

### *Standardized PCI/PCI-X Expansion*

The ExpressLane PEX 8114 is the ideal bridge for facilitating remote I/O expansion in computing, communications, or data acquisition applications (see Figure 7). The PCI SIG cabling specification work for PCI Express technology along with the ExpressLane PEX 8114 can offer a standards-based extender for the parallel PCI or PCI-X bus. Because the bridge supports reverse bridging operation, the PCI or PCI-X host system is able to remotely configure the PCI Express link and remote system.

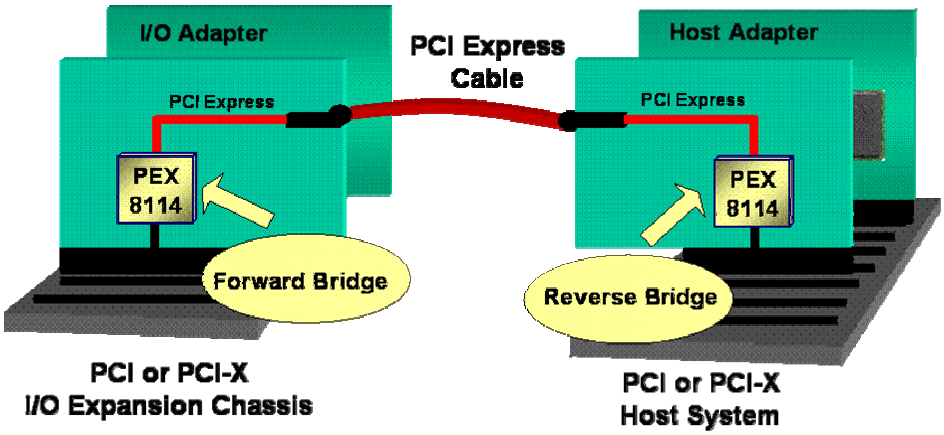


**Figure 7. Remote Expansion of PCI/PCI-X-Based Systems**

## Development Tools

PLX offers hardware and software tools (PEX 8114RDK) to enable rapid customer design. These tools include the Hardware Development Kit (HDK) and the Software Development Kit (SDK).

### PEX 8114RDK

The Forward Bridge RDK hardware module (Figure 8) includes the ExpressLane PEX 8114 with one x4 (card-edge) port and four PCI or PCI-X slots on the secondary side. The Reverse Bridge RDK (Figure 9) includes a standard PCI/PCI-X edge connector (card-edge type) and a standard PCI Express slot on the secondary side.

Each ExpressLane PEX 8114RDK can be installed in a motherboard to test and validate customer software and to evaluate the chip's features and benefits.

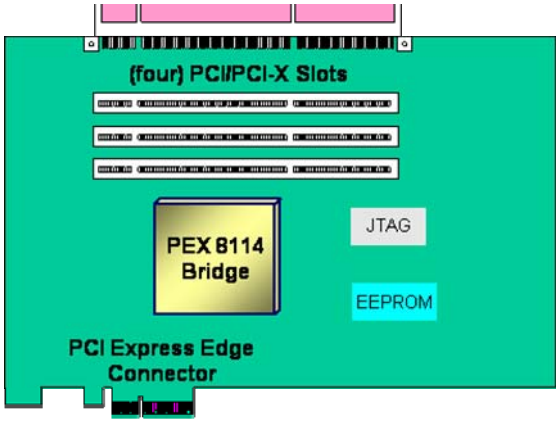


**Figure 8. PEX 8114 Forward RDK**

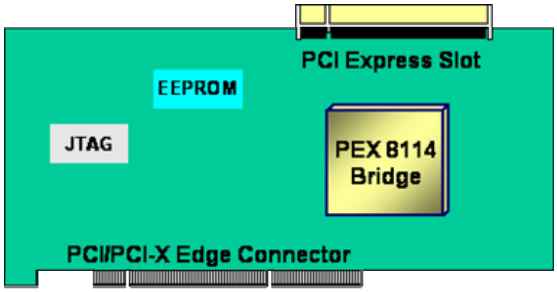


**Figure 9. PEX 8114 Reverse RDK**

### *SDK*

The SDK tool set includes (1) Linux and Windows drivers, (2) C/C++ Source code, Objects, libraries, and (3) User's Guides, Application examples and Tutorials.

## Product Ordering Information

| Part Number | Description |
|---|---|
| PEX 8114-BD13BI | PCI Express to PCI/PCI-X Bridge |
| PEX 8114-BD13BI G | PCI Express to PCI/PCI-X Bridge; lead-free ROHS compliant |
| PEX 8114RDK-F | Forward Mode RDK |
| PEX 8114RDK-R | Reverse Mode RDK |

Please visit the PLX Web site at http://www.plxtech.com or contact PLX sales at 408-774-9060 for sampling.

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