64-Lane 16-Port PCIe® Gen2 System Interconnect Switch

89HPES64H16AG2
Product Brief

Device Overview

The 89HPES64H16AG2 is a member of the IDT PRECISE™ family of PCI Express® switching solutions. The PES64H16AG2 is a 64-lane, 16-port system interconnect switch optimized for PCI Express Gen2 packet switching in high-performance applications, supporting multiple simultaneous peer-to-peer traffic flows. Target applications include servers, storage, communications, embedded systems, and multi-host or intelligent I/O based systems with inter-domain communication.

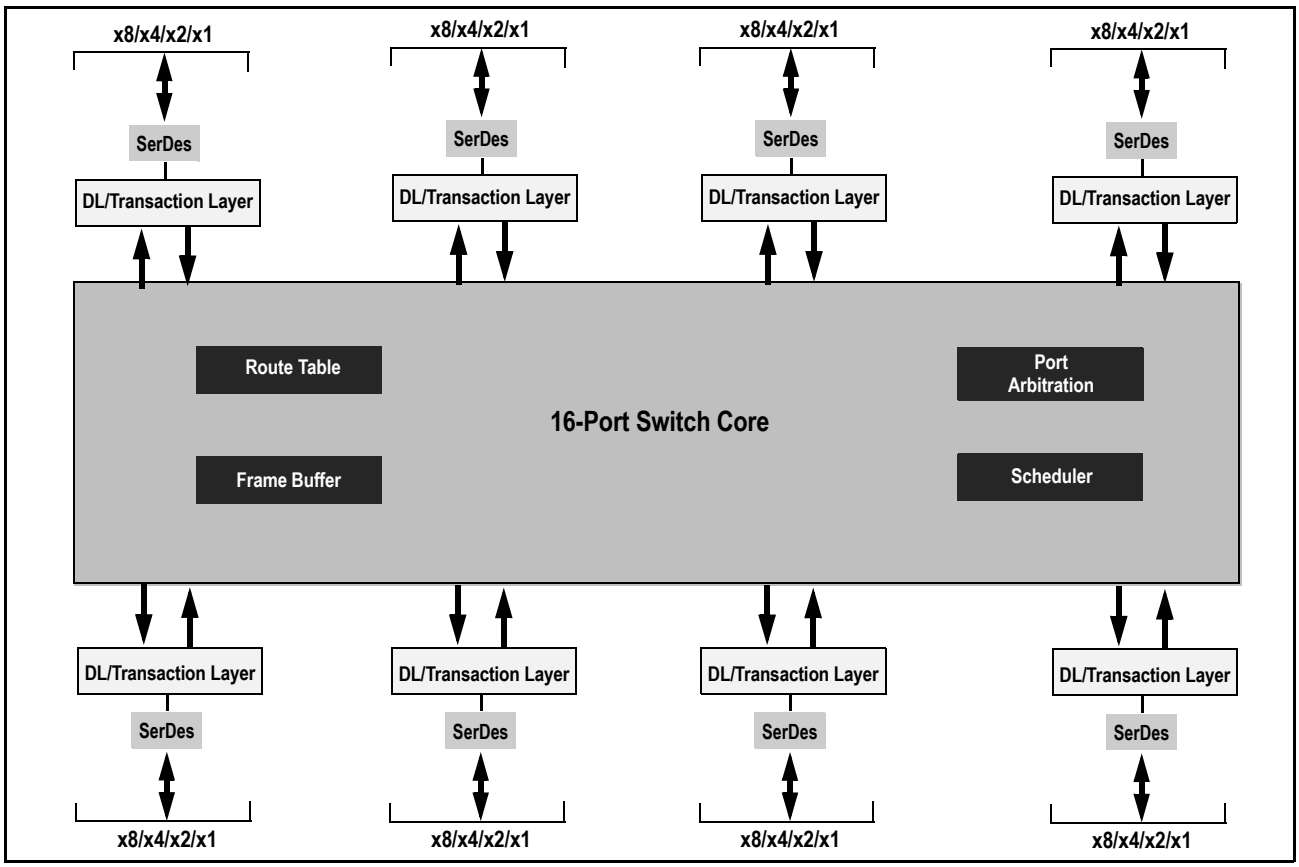
Utilizing standard PCI Express Gen2 interconnect, the PES64H16AG2 provides the most efficient system interconnect switching solution for applications requiring high throughput, low latency, and simple board layout with a minimum number of board layers. Each lane is capable of 5 GT/s of bandwidth in both directions and is fully compliant with PCI Express Base specification 2.0.

Features

- **High Performance Non-Blocking Switch Architecture**
  - 64-lane 16-port PCIe switch
    - *Eight x8 switch ports each of which can bifurcate to two x4 ports (total of sixteen x4 ports)*
  - Integrated SerDes supports 5.0 GT/s Gen2 and 2.5 GT/s Gen1 operation
  - Delivers up to 64 GBps (512 Gbps) of switching capacity
  - Supports 128 Bytes to 2 KB maximum payload size
  - Low latency cut-through architecture
  - Supports one virtual channel and eight traffic classes
- **Standards and Compatibility**
  - PCI Express Base Specification 2.0 compliant
  - Implements the following optional PCI Express features
    - *Advanced Error Reporting (AER) on all ports*
    - *End-to-End CRC (ECRC)*
    - *Access Control Services (ACS)*
    - *Power Budgeting Enhanced Capability*
    - *Device Serial Number Enhanced Capability*
    - *Sub-System ID and Sub-System Vendor ID Capability*
    - *Internal Error Reporting ECN*
    - *Multicast ECN*
    - *VGA and ISA enable*
    - *L0s and L1 ASPM*
    - *ARI ECN*
- **Port Configurability**
  - x4 and x8 ports
    - *Ability to merge adjacent x4 ports to create a x8 port*
  - Automatic per port link width negotiation (x8 --> x4 --> x2 --> x1)
  - Crosslink support
  - Automatic lane reversal
  - Autonomous and software managed link width and speed control
  - Per lane SerDes configuration
    - *De-emphasis*
    - *Receive equalization*
    - *Drive strength*
- **Switch Partitioning**
  - IDT proprietary feature that creates logically independent switches in the device
  - Supports up to 16 fully independent switch partitions
  - Configurable downstream port device numbering
  - Supports dynamic reconfiguration of switch partitions
    - *Dynamic port reconfiguration — downstream, upstream*
    - *Dynamic migration of ports between partitions*
    - *Movable upstream port within and between switch partitions*
- **Initialization / Configuration**
  - Supports Root (BIOS, OS, or driver), Serial EEPROM, or SMBus switch initialization
  - Common switch configurations are supported with pin strapping (no external components)
  - Supports in-system Serial EEPROM initialization/programming
- **Quality of Service (QoS)**
  - Port arbitration
    - *Round robin*
    - *Weighted Round Robin (WRR)*
  - Request metering
    - *IDT proprietary feature that balances bandwidth among switch ports for maximum system throughput*
  - High performance switch core architecture
    - *Combined Input Output Queued (CIOQ) switch architecture with large buffers*
- **Multicast**
  - Compliant to the PCI-SIG multicast ECN
  - Supports arbitrary multicasting of Posted transactions
  - Supports 64 multicast groups
  - Multicast overlay mechanism support
  - ECRC regeneration support
- **Clocking**
  - Supports 100 MHz and 125 MHz reference clock frequencies
  - Flexible port clocking modes
    - *Common clock*
    - *Non-common clock*
    - *Local port clock with SSC and port reference clock input*

- **Hot-Plug and Hot Swap**
  - Hot-plug controller on all ports
    - *Hot-plug supported on all downstream switch ports*
  - All ports support hot-plug using low-cost external I2C I/O expanders
  - Direct package pin support for hot-plug on 5 ports
  - Configurable presence detect supports card and cable applications
  - GPE output pin for hot-plug event notification
    - *Enables SCI/SMI generation for legacy operating system support*
  - Hot-swap capable I/O
- **Power Management**
  - Supports D0, D3hot and D3 power management states
  - Active State Power Management (ASPM)
    - *Supports L0, L0s, L1, L2/L3 Ready and L3 link states*
    - *Configurable L0s and L1 entry timers allow performance/ power-savings tuning*
  - Supports PCI Express Power Budgeting Capability
  - SerDes power savings
    - *Supports low swing / half-swing SerDes operation*
    - *SerDes optionally turned-off in D3hot*
    - *SerDes associated with unused ports are turned-off*
    - *SerDes associated with unused lanes are placed in a low power state*
- **54 General Purpose I/O**
- **Reliability, Availability and Serviceability (RAS)**
  - ECRC support
  - AER on all ports
  - SECDED ECC protection on all internal RAMs
  - End-to-end data path parity protection
  - Checksum Serial EEPROM content protected
  - Autonomous link reliability (preserves system operation in the presence of faulty links)
  - Ability to generate an interrupt (INTx or MSI) on link up/down transitions
- **Test and Debug**
  - On-chip link activity and status outputs available for several ports including the upstream ports
  - Per port link activity and status outputs available using external I^2C I/O expander for all remaining ports
  - SerDes test modes
  - Supports IEEE 1149.6 AC JTAG and IEEE 1149.1 JTAG
- **Power Supplies**
  - Requires only two power supply voltages (1.0 V and 2.5 V)
  - No power sequencing requirements
- **Packaged in a 35mm x 35mm 1156-ball Flip Chip BGA with 1mm ball spacing**

Block Diagram



64 PCI Express Lanes
Up to 8 x8 ports or 16 x4 Ports

Figure 1 PES64H16AG2 Block Diagram

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