Switchtec™ PAX Gen 4 Advanced Fabric PCIe® Switch Family

PM42100, PM42068, PM42052, PM42036 and PM42028

Summary

The Switchtec PAX Gen 4 Advanced Fabric PCIe Switch family comprises programmable and high-reliability Gen 4 PCIe switches supporting high-performance PCIe fabric connectivity to a shared pool of GPUs, NVMe SSDs and other endpoints, multi-host sharing of single-root input/output virtualization (SR-IOV) end-points, up to 100 lanes, 52 ports and hot- and surprise-plug controllers for each port. The switch family also features advanced error containment, comprehensive diagnostics and debug capabilities, a wide breadth of I/O interfaces and an integrated MIPS processor. PAX switches utilize a system-on-chip architecture that optionally enables customer-differentiated solutions through firmware customization and enhancements.

Applications for the PAX family include scalable multi-host systems, SR-IOV-enabled JBOFs, composable GP-GPU fabrics, disaggregated systems and rack scale architectures.

Features

PCIe Fabrics and Multi-Host SR-IOV Sharing

- High-performance PCIe fabric connectivity to a pool of GPUs, NVMe SSDs and other endpoints, that overcomes the limitations of PCIe tree-based topologies for rack scale multi-host systems
- Multi-host sharing of SR-IOV and multifunction endpoints
- Virtualization of entire PCIe domains and endpoints with physical and virtual functions (for example, SR-IOV NVMe SSDs)

High-Performance Non-blocking Switching

- Up to 174 GBps switching capacity
- 100-lane, 84-lane, 68-lane, 52-lane, 36-lane and 28-lane variants
- Ports bifurcate to ×1*/×2/×4/×8/×16 lanes

Error Containment

- Advanced Error Reporting (AER) on all ports
- Downstream Port Containment (DPC) on all downstream ports
- Poisoned TLP blocking
- Completion Timeout Synthesis (CTS) to prevent an error state in an upstream host due to incomplete non-posted transactions
- Hot- and surprise-plug controllers per port
- GPIOs configurable for different cable/connector standards

PCIe Interfaces

- Passive, managed and optical cables
- SFF-8644, SFF-8643, SFF-8639, OCuLink and other connectors

Diagnostics and Debug

- Transaction Layer Packet (TLP) generator for testing and debugging of links and error handling
- Built-in PCIe analyzer with flexible triggering
- Real-time 2D eye capture, PCIe Gen 4 lane margining
- External loopback
- Errors, statistics, performance and TLP latency counters

[1] x1 natively on four lanes

Highlights

- High-reliability PCIe: robust error containment, hot- and surprise-plug controllers per port, end-to-end data integrity protection, ECC protection on RAMs, high-quality, low-power SerDes
- PAX Software Development Kit (SDK): enables support for vendor-specific SR-IOV endpoint sharing and virtualization
- Integrated processor, I/O interfaces, and SDK for enclosure management firmware development
- Comprehensive diagnostics and debugging: PCIe generator and analyzer, per-port performance and error counters, multiple loopback modes and real-time eye capture
- Significant power, cost and board space savings with support for:
  - Up to 52 ports
  - Flexible ×1*, ×2, ×4, ×8, and ×16 port bifurcation with no restrictions on configuring ports as either upstream or downstream
- Secure system solution with boot image authentication
- No external CPU required for fabric management or SR-IOV sharing
- Simple fabric management API for configuration and management over in-band PCIe, UART, TWI or Ethernet

Peripheral I/O Interfaces

- Up to 11 two-wire interfaces (TWIs) with SMBus support
- Up to 4 SFF-8485-compliant SGPIO ports
- Up to 103 parallel GPIO pins
- 10/100 Ethernet MAC port (MII/RMII) (PAX 100x/84x/68xG4)
- 16-bit local bus interface with ECC protection
- Up to 4 UARTs
- JTAG and EJTAG interface

High-Speed I/O

- PCIe Gen 4 16 GT/s
- Supports optional PCIe-compliant link training and manual PHY configuration that supports OCuLink cabling, CEM ×16 slots and other interfaces

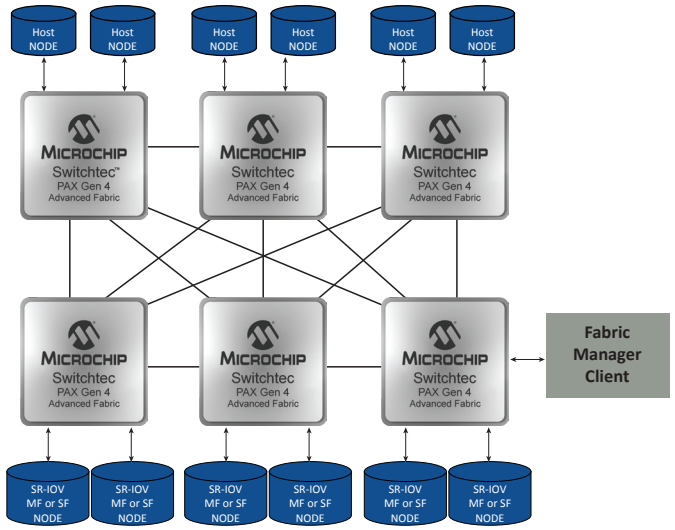
ChipLink Diagnostic Tools

- Extensive debug, diagnostics, configuration and analysis tools with an intuitive GUI
- Access to configuration data, management capabilities and signal integrity analysis tools (such as real-time eye capture)
- Connects to device over in-band PCIe or sideband signals (UART and EJTAG)

Evaluation Kits

The PM42100-KIT Switchtec Gen 4 PCIe switch evaluation kit is a device evaluation environment that supports multiple interfaces including optical PCIe-compliant link training and manual PHY configuration.

Example Application



Ordering Information

Product	Part Number	Lanes	Ports	Hot-Plug Controllers	Package
PAX 100xG4 Gen 4 Advanced Fabric PCIe® Switch	PM42100B1-FEI	100	52	52	40 mm × 40 mm
PAX 84xG4 Gen 4 Advanced Fabric PCIe Switch	PM42084B1-FEI	84	44	44	40 mm × 40 mm
PAX 68xG4 Gen 4 Advanced Fabric PCIe Switch	PM42068B1-FEI	68	36	36	40 mm × 40 mm
PAX 52xG4 Gen 4 Advanced Fabric PCIe Switch	PM42052B1-F3EI	52	28	28	29 mm × 29 mm
PAX 36xG4 Gen 4 Advanced Fabric PCIe Switch	PM42036B1-F3EI	36	20	20	29 mm × 29 mm
PAX 28xG4 Gen 4 Advanced Fabric PCIe Switch	PM42028B1-F3EI	28	16	16	29 mm × 29 mm
PAX-A 52xG4 Gen 4 Advanced Fabric PCIe Switch, Automotive Qualified	PM45052B1-F3EI	52	28	28	29 mm × 29 mm
PAX-A 36xG4 Gen 4 Advanced Fabric PCIe Switch, Automotive Qualified	PM45036B1-F3EI	36	20	20	29 mm × 29 mm
PAX-A 28xG4 Gen 4 Advanced Fabric PCIe Switch, Automotive Qualified	PM45028B1-F3EI	28	16	16	29 mm × 29 mm