BROADCOM®

Product Brief

SAS3816 Tri-Mode IOC

High-Port Count PCIe 4.0 x8, 16-port SAS/SATA/ NVMe IOC Featuring Tri-Mode SerDes Technology

Up to 2x Performance Benefits than Previous Generations

Key Features

- High-performance I/O Processor
- Hardware Secure Boot
- Dual-core Arm A15 at 1600 MHz
  - 32 KB L1 I/D caches
  - 1 MB shared L2 cache
  - 6 MB on-chip memory
- PCIe 4.0 Host Interface:
  - Supports x8, x4, x2, x1 PCIe lanes at a transfer rate up to 16.0 GT/s per lane, full duplex
  - Lane and polarity reversal
  - Supports End-to-End CRC (ECRC) and Advanced Error Reporting (AER)
  - PCIe hot plug support
  - Variable PCIe bandwidth negotiation
- x16 Tri-Mode Devices Lanes (PCIe4/SAS3/SATA):
  - x8, x4, x2, x1 PCIe device port configurations
  - Supports 12, 6, and 3 Gb/s SAS and 6 and 3 Gb/s SATA data transfer rates
  - Spread spectrum clocking
  - Supports SSP, SMP, STP, and SATA protocols
  - Supports narrow and wide ports
  - T-10 End to End Data Protection (EEDP)
  - T-10 optical support
  - SAS 2.1 power management
  - Supports up to 2,000 SAS/SATA devices

Broadcom Storage

Broadcom enables high-performance storage connectivity and flexible system designs that support various combinations of SAS, SATA, and NVMe devices. Broadcom offers the industry's broadest portfolio of storage solutions, backed by decades of experience and trusted by the world's leading server and storage suppliers. Broadcom provides the building blocks for storage solutions that help customers understand, prioritize, store, and protect critical data.

Overview

The SAS3816 IOC, based on the industry-leading Fusion-MPT (Message Passing Technology) architecture, supports up to 16 PCIe devices direct attached (32 total). This Gen 4.0 PCIe x8, 16-port IOC, which delivers enhanced performance and power reductions over previous generations, features Tri-Mode SerDes Technology that enables a seamless operation of SAS, SATA, and NVMe storage devices from any system design.

The 16-port Tri-Mode IOC device interface provides SAS data transfer rates of 12, 6, and 3 Gb/s per lane, SATA data transfer rates of 6 and 3 Gb/s, or PCIe data transfer rates of 16.0, 8.0, 5.0, and 2.5 GT/s. The device automatically negotiates between the speeds and protocols. The SCSI Protection Information for early detection of and recovery from data corruption, and Spread Spectrum Clocking (SSC) for EMI reduction are supported. Additional features include SAS 2.1 power management and DataBolt Technology allowing users to take advantage of 12 Gb/s speeds while utilizing existing SAS and SATA 6 Gb/s drives and backplanes.

The SAS3816 host interface supports 8 PCI Express (PCIe) lanes and complies with the PCIe 4.0 specification, offering up to 3 million 4k RR/RW IOPS. It also incorporates power management, MSI/MSI-X and legacy interrupt generation. The SAS3816 IOC capitalizes on the next-generation PCIe interface by delivering improved bandwidth over previous generations, supporting up to 13,700 MB/s.

The SAS3816 IOC supports a high-performance dual-core Arm A15 processor resulting in a cost-effective IOC ideal for entry and mid-range servers. The IOC can support up to 2,000 SAS or SATA devices and 6,000 outstanding IOs. It supports up to 16 direct attached NVMe devices and complies with PCIe 4.0 specifications, PCIe Dynamic Power allocation (DPA), ECRC, and AER with compatible devices. The IOC also supports NVMe over PCIe devices.

Key Features (cont.)

- Supports DataBolt bandwidth aggregation technology
- Separate Refclk Independent SSC (SRIS)
- PCIe application layer supports NVMe
- Up to 32 NVMe devices supported (switch required)

- Advanced Power Management support
  - Slumber and Partial power mode support for SAS and SATA devices
  - Programmable SAS link power down
  - Variable PCIe bandwidth negotiation
- External memory interface support
  - SPI-based Flash ROM
- Communication Interfaces
  - I^2C interfaces for enclosure management services
  - UART and Ethernet interface for debug
- SFF-8485 Compliant, SGPIO
- JTAG support
- Package (estimated): 27 mm

Applications

- Direct-attached SAS/SATA/NVMe IOC solutions for server and storage applications
- SAS/SATA/PCIe host bus adapter
- Cost effective, single-chip solution for entry-level storage systems supporting up to 16 direct-attach drives
- SAS Target Mode support for external storage applications
- Utilize NVMe attached SSDs with confidence of industry leading device management and error recovery

Broadcom provides a complete suite of industry standard operating system drivers and supports Virtual Operating Systems with device emulation and para-virtualization.

The Hardware Secure Boot feature, which permits only authenticated firmware to execute, requires the controller to boot from an Internal Boot ROM (IBR) to establish the initial root of trust. Hardware Secure Boot authenticates and builds a chain of trust with succeeding software using this root of trust.

Fusion-MPT Architecture Overview

Fusion-MPT architecture marks the next generation of I/O architecture designed to deliver the highest performance available today while reducing time to market, integration, and certification time. Fusion-MPT devices are high performance, cost-effective protocol controllers that represent the newest system-level integration technology in intelligent I/O processors from Broadcom.

Specifications

Attribute	3816
PCIe Host Links	x8, Gen 4.0
SAS Port Configurations (Lanes)	x1/2/4/8 (16) 12 Gb/s
PCIe Port Configurations (Lanes)	x1/2/4/8 (16) 12 Gb/s
Processor Core	Arm A15
Context RAM	6 MB
DataBolt Support	Yes
IOPS (4K RR)	3M
BW (MBs)	13,700
Power (WC/TYP)	14.1/10.3W
Process	16 nm
Package Type/Size	FPBGA (27 mm × 27 mm)

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