PRODUCT BRIEF

Supports GHz Frequencies for Advanced SoC Designs

- GHz product frequencies support the demanding needs of high performance multi-core processors, DDR3/4, and LPDDR4 memory subsystems

Advanced Concurrency

- Virtual channels allow optimal data flow through the network, efficiently utilizing logic, and wiring resources without head of line blocking
- Full memory interleaving support including reorder buffers for maximum performance
- Patented Quality of Service approaches

Eases System Partitioning for SoCs with Multiple Domains

- Integrated logic for managing multiple complex power, voltage, and clocking domains globally and within local subsystems
- Easy design flow and timing closure

Reduces Wiring Congestion

- Serialized, packetized fabric with virtual channels reduces total wire length
- Native AMBA and OCP Interfaces
- Socket support for AXI3/AXI4/ACE-Lite and OCP 2/3
- Efficient and flexible interfaces to popular IP cores supports full performance at optimized area

Flexible Topologies for Best Results

- Seamless subsystem integration
- Match topology to design requirements
- Easy refinement to match floorplan

SonicsGN$^{®}$ (SGN) is Sonics' 4th generation, configurable, on-chip network enabling the design of advanced System-on-Chip (SoC) devices using a high-speed scalable fabric topology structure. SGN's configurable intellectual property (IP), intuitive user interface, and robust verification environment provide all the tools necessary to create speedy, robust, gate-efficient on-chip communication networks for advanced SoC designs. Target applications include: networking, smart mobile devices, IoT wearables, and home consumer electronics.
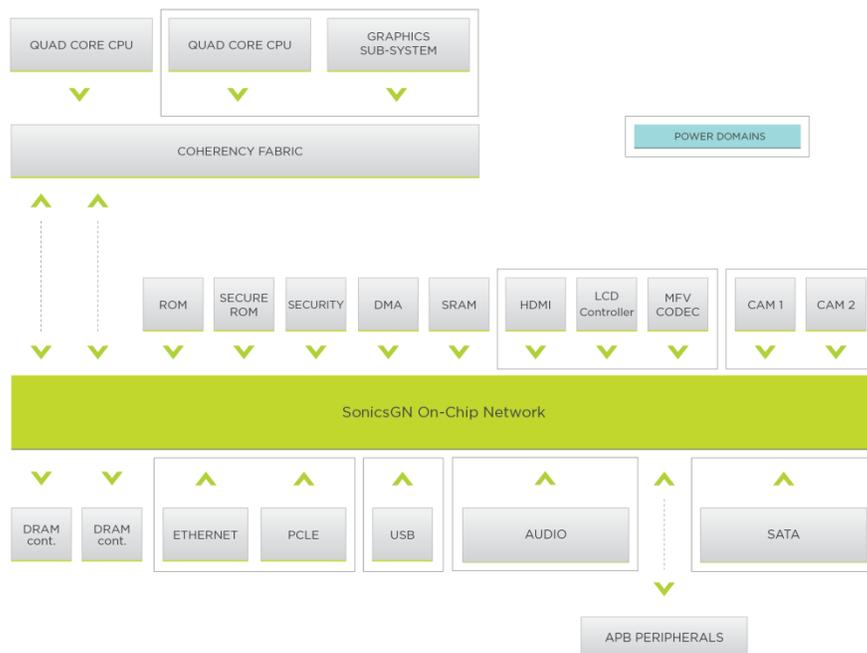
SGN provides a high-performance fabric that transports packetized transactions, utilizing routers as the fundamental switching elements. Routers allow for pipelining and buffering, enabling designers to tailor these elements to their exact requirements for area and frequency. Like all of Sonics' networks, SGN's fabric is surrounded by intelligent agents that adapt to the interface protocols of the attached IP cores and can easily be combined with other Sonics connectivity components, allowing the SoC designer unlimited flexibility when designing complex connectivity solutions for advanced SoC devices. This flexibility ensures the lowest area, improves wiring efficiency, and provides the highest frequency and throughput networks.

In addition, SGN offers designers a variety of rich features which enable the customization and streamlining of advanced fabric generation, including: rich power/clock domain partitioning, ACE-Lite, AXI and OCP native protocol support, advanced concurrency mapping including virtual channels, robust Quality of Service (QoS), advanced address mapping, and power and error management capabilities. These are just some of the features that make SGN the clear choice for advanced on-chip network design.

SGN is configured using Sonics advanced development environment: SonicsStudio® Director. Director provides a precise methodology and workflow to assist the architects and designers in the creation, optimization, and verification of the on-chip network.

Feature Highlights

Scalability
SGN's router-based switching fabric allows for efficient gate count and scalability

- Input-buffered routers and connecting links easily scale in frequency and connectivity to match SoC requirements
- Per-link virtual channels with credit-based flow control enable excellent timing closure with maximum concurrency
- Aggressive serialization capabilities reduce wire congestion by 80% compared to traditional fabrics
- SGN provides direct interfacing to other fabrics to optimize area and latency for subsystems and peripherals

Partitioning Support
SGN provides robust and automated support for voltage, power and clock domain crossings at any internal link:

- Supports 1:1 and 1:N synchronous, mesochronous, and asynchronous clock relationships
- Crossing components automatically inferred based on endpoint clock and power domain differences
- Design environment provides user control over crossing configuration and outputs associated CPF/UPF plus partitioned RTL

Concurrency
SGN provides robust concurrency features at the fabric interface (agent), as well as throughout the fabric itself. The SGN concurrency enables out-of-order transaction completion within the network or at the target through the use of virtual channels, OCP tags or AXI IDs. The concurrency schemes allow performance of the system to be improved through the optimization of link utilization throughout the network:

- Flexible/dynamic mapping of concurrency between initiators, links and targets
- Virtual channels avoid deadlock, enable traffic to overtake blocked or lower priority streams using non-blocking flow control, lowering total wire length and congestion
- Full support for interleaved memory channels, dynamic concurrency generation, and SRAM-based reorder buffers

Quality of Service
Protecting data flows within complex designs has become a critical part of advanced SoC programs. Sonics provides flexible QoS mechanisms within SGN to enable chip designers to effectively tune their system performance and minimize gate count while ensuring priority traffic flows remain uninterrupted:

- Target-based QoS associates virtual channels with one of three traffic classes, featuring low latency and guaranteed bandwidth classes that are serviced at high priority while within their bandwidth allocation
- Transaction-based QoS assigns each transaction one of four priority levels based upon the state of the AXI4 AxQOS signals

Power Management
Using SGN's robust partitioning support, designers can choose to partition SGN into multiple power management domains to allow for safe and flexible power management control by an external system power manager.

- Support for easy design of an external system power manager
- Provides a 'power bundle' interface for each domain that includes power down handshake, auto wake-up, and idle/active signals
- Allows for fast and efficient wake-up and shut-down

Rich Error Management Support
Detection, aggregation, logging, reporting, and recovery support for command, addressing, security, timeout, power management, and IP core reported errors.

Native Protocol Support
AXI3, AXI4, AXI ACE-Lite, and OCP protocols are natively supported within SGN, allowing cores with any interface to be connected directly to the SGN fabric. The companion Sonics Connect product provides optimized connections to groups of AHB and APB cores.

Floor Plan Topology Optimization
SGN provides power and clock domain partitioning coupled with the ability to overlay virtual channels onto different routers. Flexible router placement capabilities allow the logical topology to match the physical/floorplan requirements of the device.

- Performance-optimized flows can be preserved with the flexibility to alter physical partitioning
- Power and clock domain partitioning can be introduced after the topology has been frozen

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