

Synopsys and Starblaze Technology

Starblaze Technology Achieves Volume Production of SSD Controller SoC With Synopsys' DesignWare IP Portfolio



“With stringent design requirements and a tight time-to-market window, we needed an IP supplier that would provide high-quality and reliable processor, foundation, security and interface IP. Synopsys' extensive DesignWare IP portfolio gave us access to the entire range of IP we needed, enabling us to achieve first-pass silicon success for our SSD controller.”—Sky Shen, CEO, Starblaze Technology

Business

Starblaze Technology was founded in Nov, 2015 in China and completed A-Round funding in July, 2016. The company is headquartered in Beijing and has R&D in Shanghai/Chengdu. Starblaze Technology aims to be a world-class enterprise SSD controller/solution design house, speeding up SSD storage applications in data centers, and providing one-stop service from the client to the cloud.

Challenges

- ▶ Deliver high-performance, low power and small footprint SSD controller
- ▶ Deliver SSD with highest levels of security to meet new requirements of the SSD market
- ▶ Acquire high-quality, silicon-proven IP to meet aggressive time-to-market schedules

Synopsys Solutions

- ▶ DesignWare[®] ARC[®] HS38 Processor and MetaWare Development Toolkit
- ▶ DesignWare Foundation IP: Logic Libraries, Embedded Memories and High Performance Core (HPC) Design Kits
- ▶ DesignWare True Random Number Generators (TRNGs)
- ▶ DesignWare Interface IP: DDR4 and PCI Express[®] 3.1 Controller and PHY IP

Benefits

- ▶ Achieved first-pass silicon success and volume production for STAR1000 SSD controller
- ▶ Reduced power consumption and I/O latencies by 50 percent
- ▶ Reduced SoC area by 7 percent
- ▶ Implemented the highest level of security while achieving the best combination of power, performance and area

“We needed a high-performance, low-power processor for our SSD controller. After conducting competitive analysis, micro-architecture exploration and hardware/software benchmark analysis, we determined that Synopsys’ silicon-proven ARC HS38 processor delivered better performance with half the power consumption of competing processors, and was the best solution to meet our requirements.”—Sky Shen, CEO, Starblaze Technology

Overview

Starblaze Technology’s STAR1000 is an enterprise storage SSD controller designed to deliver maximum flexibility and high performance with minimal power consumption while meeting new security requirements for the SSD market. To achieve these stringent design goals, Starblaze Technology needed a range of high-quality processor, foundation, security and interface IP from a vendor with a track record of demonstrated silicon success. After evaluating solutions from leading IP providers, they were confident that Synopsys’ DesignWare IP portfolio had everything they needed to meet the power, performance, area and security requirements for their SSD controller.

High-Performance DesignWare ARC Processors

Starblaze Technology selected Synopsys’ ARC HS38 processor and MetaWare Development toolkit and took advantage of a number of HS38 features to improve performance, reduce power consumption and accelerate software development for their STAR1000 SSD controller. Starblaze Technology used multicore implementations for efficient resource sharing and scheduling to achieve the high IOPS they needed, and the 40-bit physical address extension to support one Terabyte of physical memory size. To achieve the extremely high data reliability over long periods of operation that SSDs require, Starblaze Technology took advantage of the HS core’s error correction code (ECC) support for embedded memories on the core, which provides implicit error handling by the processor without software programming overhead. The combination of the ARC HS processor features and the ability to add custom instructions with APEX technology enabled Starblaze Technology to achieve lower power consumption and reduce I/O latencies by 50 percent over competing alternatives. “The ARC HS38 processor provided the functionality to do everything we needed, while offering a uniquely flexible architecture that allowed us to add custom instructions, condition codes, core registers and auxiliary registers, which helped us to significantly reduce I/O latencies,” said Sky Shen, CEO at Starblaze Technology.

Improved Performance, Power & Area With DesignWare Foundation IP

Starblaze Technology selected the DesignWare HPC Design Kit’s suite of high-speed and high-density memory instances and standard cell libraries with multi-bit flip flops to optimize their DSP cores and SoC for the optimum balance of performance, power, and area. The DesignWare Embedded Memories provided advanced power management features such as light sleep, deep sleep, shut down and dual power rails, which allowed Starblaze Technology to meet their stringent low-power requirements.

Standards-Compliant DesignWare Security IP

To reach the new security levels required for the SSD market, Starblaze Technology integrated the standards-compliant DesignWare True Random Number Generator to generate keys and other cryptography data required by the security protocols in their enterprise storage SoC. The security IP enables protection against malicious attacks and security backdoor issues, which is critical for Starblaze Technology’s SoCs. Synopsys’ high-quality DesignWare TRNG IP is FIPS 140-2 certified in customer field deployments and offers a high-quality entropy source to enable the highest level of security.

Silicon-Proven DesignWare Interface IP

Starblaze Technology selected DesignWare IP for DDR4 and PCI Express 3.1 due to their extensive feature sets and long track records of silicon success in hundreds of customer designs. The DesignWare DDR4 IP enables more efficient memory access in its storage applications. The IP supports high-capacity DDR4 and DDR4 3D stacked (DDR4-3DS) DRAM with 16 ranks of memory to expand capacity by up to 400 percent compared to the previously supported four ranks, without reducing performance. Starblaze Technology also integrated the high-performance DesignWare IP for PCI Express 3.1, which delivers 98 percent throughput efficiency with low latency. Starblaze Technology's STAR1000 SSD Controller utilizes the DesignWare IP for PCI Express 3.1 Single Root I/O Virtualization (SR-IOV) features to increase performance when incorporated into enterprise systems using virtualization to share the SSD across multiple CPUs or operating systems. "Integrating the DesignWare DDR4 and PCI Express 3.1 IP enabled us to include reliability, availability and serviceability features that helped us to increase our data protection, system availability and issue diagnosis," said Shen.

With the full range of DesignWare IP they needed, Starblaze Technology easily integrated the DesignWare IP into their design well within their development schedule. With the first-pass silicon success and volume production of their design using Synopsys' DesignWare IP, Starblaze Technology intends to continue using a portfolio of DesignWare IP in future projects.

“The combination of Synopsys’ DesignWare Security and Foundation IP enabled us to implement the highest level of security while achieving the best combination of power, performance and area for our SoC.”

—Sky Shen, CEO, Starblaze Technology