

# Pixim and Synopsys

## Synopsys VCS Verification Library IP for AMBA Catches Bugs Early in Design Cycle, Improving Time to Market

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David Jenne, Design Verification Manager, Pixim, Inc.

### Business

Supplier of image capture and processing systems that delivers industry-leading video image quality

### Issues

- Bring business-critical next-generation product to market
- Create a design that works the first time
- Minimize time to market

### Solution

Synopsys VCS Verification Library IP for the AMBA™ protocol

### Benefits

- Achieved first-time silicon success
- Identified over a dozen design bugs, many of which would have been missed without VCS Verification Library IP
- Removed the need for internal verification IP development that would have cost time to market
- Performed debugging earlier in the design process, avoiding the inefficiency of last-minute repairs

- Achieved well over 95% functional test coverage, instilling tapeout confidence

### Overview

Pixim needed an environment to verify the design of the latest version of its flagship image processing product, in which the sub-system is based on the ARM® AMBA™ 2.0 on-chip bus protocol. Rather than develop their own AMBA test environment, Pixim used Synopsys VCS Verification Library IP solutions for the AMBA 2.0 protocol. Not only did this decision save weeks of time to market, but it allowed for comprehensive verification that revealed over 12 bugs very early in the design cycle. Without VCS Verification Library IP some of these design errors would probably not have been found, jeopardizing the silicon success that Pixim required.

### Time to Market Critical in Designing Second Generation Product

Pixim provides image capture and processing systems that deliver top quality moving and still images. The company's Digital Pixel System® platform combines image sensing and processing into a single optimized system that is incorporated into video cameras

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and other devices, often for security applications. One of the key technologies the chipset employs is the AMBA interconnect.

The first generation of the Digital Pixel System platform was successful through the exceptional efforts of the design team, who had to repair many AMBA High-speed Bus (AHB) errors in the original design that were only identified near the end of the project. Since it took considerable effort to perform these repairs so late in the design cycle, Pixim was determined to find a better approach for the next product iteration. This second generation product is at the very core of the company's business, and so it absolutely had to work correctly the first time and get to the market quickly.

“It appeared that the project required us to develop an AMBA verification environment internally, which would have taken weeks,” says David Jenne, Design Verification Manager. “Rather than accept a big delay in our time to market, we began looking for alternatives and quickly learned about the Synopsys VCS Verification Library IP solutions for the AMBA protocol. We used Synopsys VCS® comprehensive RTL verification solution for full-chip verification, and discovered that under our Synopsys agreement we had a license for the VCS Verification Library, which included the high quality Verification IP for the AMBA protocol. The Verification IP had all the required features and was available immediately, which made it an easy decision to adopt the Synopsys offering.”

#### **VCS Verification Library IP for AMBA Saves Weeks of Development Time**

It took Pixim just two days to download the VCS Verification IP (VIP) for AMBA and become familiar with it, and another day to insert a module of the image processor design and begin running simulations. Pixim saved even more time by using the VIP's testbench examples as a head start in building their own. “The whole process was fast and straightforward, and the VIP is easy to understand and use,” says Jenne. “We never had a single reason to call on Synopsys for support.”

Pixim used the VCS Verification Library IP for AMBA to individually test three of the most important modules that comprise the design. In each case they tested how the module worked in conjunction with the rest of the circuit, using the VCS Verification Library AMBA AHB master and slave models to generate and respond to bus traffic and the monitor to check for protocol violations. The team performed coverage analysis using Synopsys VCS' unified code, assertion and functional coverage capabilities. The results showed well over 95% functional coverage at the module level — raising confidence that they would see first silicon success.

The Pixim design team, which included engineers Casey McMullen and Eddie Cheng, took advantage of the VCS Native Testbench (NTB) feature to speed up the performance of their verification environment that included the VCS Verification Library IP and the RTL design modules. They used constrained-random transaction generation to create an enormous amount of design traffic based on minimal code and effort.

#### **All Design Bugs Found and Fixed, with First Silicon Success to Prove It**

The testing process revealed over 12 AMBA-based protocol errors in the design that Pixim efficiently repaired. As soon as the team was confident that all the flaws had been found and fixed, they taped out the design, submitted the chip for fabrication, and were soon rewarded with successful first silicon.

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“Do we recommend Synopsys VCS Verification Library IP solutions for the AMBA Protocol? Absolutely,” concludes McMullen, adding with a smile, “to everyone but our competitors of course!”

