

# Synopsys and Faraday

## Faraday Technology Corporation Achieves Over 50% Performance Improvement on PCIe Controller Designs with Synplify



*The Synplify Premier product not only delivered a very substantial performance improvement - over 50% - but also proved to be a big winner in every other way. We highly recommend it to other companies with needs like ours.”*

**Pearson Chen**

Design Engineer, Faraday Technology Corporation

### Summary

Faraday Technology Corporation, a leading IC design services company and intellectual property (IP) provider, had to boost performance from 80 MHz to 125 MHz on a pair of new designs for a key product line, the PCIe controller IP family. By employing the Synplify<sup>®</sup> Premier and Identify<sup>®</sup> tools from Synopsys, Faraday not only achieved its 125 MHz goal but also saved on time to market, area, and cost. The designs passed the vital PCI SIG Compliance Program certification tests and are now on their way to ASIC implementation and the market.

Synopsys provided excellent support to help Faraday get started with its new tools, further strengthening the technological partnership the two companies have enjoyed for many years.

### Faraday Encounters Performance Challenges With PCIe Controller Designs

Faraday Technology Corporation is a major fabless ASIC vendor and IP supplier headquartered in Taiwan. Faraday's Mixed Signal Development group provides mixed-signal IP such as USB, PCIe, SATA, A/D, and D/A solutions. These products have become very popular and, in fact, Faraday's USB IP is used in most of the world's USB devices today.

Faraday commenced design of two new PCIe controllers, one with an AHB wrapper and one without, for incorporation into the PCIe controller IP product line. The designs were specified to run at 125 MHz, setting new performance standards for the industry. However the first FPGA implementation fell far short at 80 MHz in some critical cases.



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### **Synplify Premier Product Delivers One-Pass Timing Success**

"The new PCIe controller IPs are very important to Faraday's business, and so we absolutely had to find a way to get performance up to 125 MHz," said Pearson Chen, Design Engineer for Faraday. "So we turned to our trusted technology partner, Synopsys, who has ably fulfilled our FPGA synthesis and support needs for many years. They introduced us to the Synplify Premier tool, which proved to be so powerful and easy to use that we didn't consider any other solution to our problem."

Synopsys' support staff in Taiwan provided a short Synplify Premier training course and helped Faraday apply the product to the challenges of the PCIe controller designs. Faraday incorporated the Synplify Premier product into its flow, which also included the Xilinx ISE place-and-route tool. Faraday's engineers found this flow to be very smooth and easy to use, allowing them to perform synthesis and place-and-route together in batch mode.

"We had suspected that our problems in the previous flow were due to false paths, and the Synplify Premier solution equipped us to find them easily," said Chen. "We met timing in a single pass, which allowed us to complete the designs on schedule, running at the required 125 MHz. The Synplify Premier tool also allowed us to reduce the logic consumed on the FPGA, which allowed us to use a smaller part and save on device cost."

"The graph-based physical synthesis approach used by Synopsys in their Synplify Premier product was essential in helping us close on timing quickly," Chen continued. "Graph-based physical synthesis understands timing delays in the routing structures for Xilinx FPGAs and uses this information during synthesis, so the timing estimates are very accurate."

### **Identify Tool Saves Substantial Debugging Time And Effort**

"By helping us find false paths, the Synplify Premier product allowed us to focus our debugging efforts on true functionality bugs rather than bugs caused by timing problems," Chen added. "With the Identify RTL debugging tool included in the Synplify Premier package, we were able to expedite the location and repair of functional errors. For many types of problems, the Identify tool is far better than the traditional debugging aids, emulators, and logic analyzers. It is much faster than emulators, and does not suffer from the pin limitation problems of logic analyzers. In fact we don't need logic analyzers at all any more - we just debug using the Identify tool."

As the next step in the productization of the PCIe controller IP, Faraday submitted the designs for PCI SIG Compliance Program certification, a vital step for engendering customer trust. One design passed the test and the other design has been integrated with other IP on one of Faraday's platform products. In addition, both designs have been integrated with other Faraday IP to construct a platform for demonstration of the PCI Express Ethernet add-on card. Both designs are now on their way toward implementation in ASICs. Meanwhile Faraday is preparing to use the Synplify Premier solution in even higher performance design projects.

"The Synplify Premier product not only delivered a very substantial performance improvement - over 50% - but also proved to be a big winner in every other way," Chen concluded. "We highly recommend it to other companies with needs like ours."