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Sharp Corporation and Cadence

"Cadence helped us achieve our target in the highly competitive arena of CMOS image sensors. We were able to deliver the highest quality of silicon and get to market significantly faster than would have been possible with our previous flow."

Naoya Fujita, General Manager of Product Planning, Electronic Components and Devices Group, Sharp

The Customer

Sharp Corporation is a Japan-based company known around the globe for its electronic products and technologies, such as solar panels, audio-visual entertainment equipment, LCD panels, projectors, microwave ovens, complementary metal-oxide-semiconductor (CMOS) sensors, charge-coupled device (CCD) sensors, and Flash memory. The company is dedicated to improving people's lives through the use of advanced technology and a commitment to design innovation, quality, and value.

The Challenge

Recently Sharp embarked on designing a new consumer electronics CMOS image sensor. A CMOS imaging chip is an active pixel sensor with circuitry that converts light energy to voltage, and circuitry that converts voltage to digital image data.

The market for sensors and micro-electromechanical systems (MEMS) devices is exploding—driven by the rising demand for user-friendly consumer electronics in everything from automobiles, computers, medical equipment, and portable products such as media players, tablets, and smartphones. This puts pressure on Sharp to produce highly differentiated products in increasingly tight timeframes.

"On this particular project we faced timing and routability convergence challenges and needed a digital flow that was up to the task," says Naoya Fujita, General Manager of Product Planning, Electronic Components and Devices Group, Sharp.

Business Challenge
- Speed a new CMOS image sensor's time to market without sacrificing product quality

Design Challenge
- Address timing and routability convergence challenges

Cadence Solutions
- Encounter RTL-to-GDSII flow
- Encounter RTL Compiler
- Encounter Conformal Equivalence Checker
- Encounter Digital Implementation System
- Encounter Test

Results
- 2x improvement in turnaround time
- Higher quality results in timing, area, and productivity

"The convergence process generally involves time-consuming design iterations between synthesis and place-and-route (P&R) tasks and can take up a large portion of total design-implementation time."

" Cadence offered the most mature, production-proven digital flow to meet our design needs for this project and beyond."

The Solution

Sharp decided to adopt the Cadence® Encounter® RTL-to-GDSII flow to develop its CMOS image sensors. This included standardizing on Encounter RTL Compiler, Encounter Conformal® Equivalence Checker, Encounter Digital Implementation System, and Encounter Test.

The Encounter RTL-to-GDSII flow provided Sharp with fast and flexible feasibility analysis, giving its design engineers an early and accurate view of whether the complex design would meet their targets and be physically realized. Using the Cadence digital flow, Sharp had a predictable path to closure on a low-power design that yielded well.

"Cadence offered the most mature, production-proven digital flow to meet our design needs for this project and beyond," Fujita says. "We wanted to increase our efficiency while designing the sensor so our customers could capture the growing market demand for their end products, and Cadence offered a complete, streamlined solution to enable us to meet this goal."

One key benefit of the Encounter RTL-to-GDSII flow was physical-aware register-transfer level (RTL) synthesis. This takes physical layout information into account to address timing and congestion issues much earlier in the design process than is possible when using a conventional flow. Encounter Test On-Product Clock Generation (OPCG) inserted automatically into the design netlist through RTL Compiler synthesis enabled the Sharp design team an at-speed ATPG test flow thus improving overall test quality.

In addition, Encounter Digital Implementation System offered the Sharp design team comprehensive, advanced technology to complete digital implementation from netlist synthesis to P&R, including concurrent in-design validation.

"The Cadence solution offered much better congestion handling and faster timing convergence than our previous methodology," Fujita says.

Results

Using the Encounter RTL-to-GDSII flow and its integrated product technologies, Sharp achieved a 2x faster turnaround time compared to its previous digital flow. In addition to speeding time to market, the design team experienced higher quality results in timing, area, and productivity.

"Cadence helped us achieve our target in the highly competitive arena of CMOS image sensors," Fujita says. "We were able to deliver the highest quality of silicon and get to market significantly faster than would have been possible with our previous flow."

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Summary and Future Plans

"Once we switched to the Cadence Encounter RTL-to-GDSII flow, we saw dramatic improvements in turnaround time and better quality designs," Fujita concludes. And Sharp will continue to use Cadence solutions for upcoming projects. "We exceeded our design requirements and expectations, and look forward to continued collaboration with Cadence to meet the growing demand for high-quality CMOS images sensors."