

National Semiconductor

SiClone automates physical migration of custom mixed-signal designs

Corporate Profile

National Semiconductor is the premier analog company driving the information age.

Business Challenge

Leverage diverse IP to create integrated SoCs solutions for information appliances

Objective

Migrate full-custom analog USB transceiver block to an advanced process technology

Results

Completed automated migration to hand-crafted standards with 4x productivity gain

Faced with migrating a full-custom, hand-crafted mixed-signal circuit block layout to a new 0.15 micron process technology, National engineers relied on Sagantec's SiClone to automate the migration process. Using SiClone, the National team turned out a fully migrated block layout that appeared hand crafted, yet required only a quarter the time needed with conventional manual methods. By automating the process, SiClone delivered results that maintained National's exacting standards, while helping to accelerate its design deadlines and product schedules.

National Semiconductor Solutions

National Semiconductor is focused on fast growing markets for wireless handsets; information appliances; information infrastructure; and display, imaging and human interface technologies. With about 9,700 employees worldwide, National reached \$2.1 billion in sales for its last fiscal year.

As new opportunities arise in these emerging competitive markets, National responds with powerful, feature-rich, flexible and scaleable integrated solutions. To create these solutions, National implements many different IP blocks very quickly and integrates them all on one chip – delivering a highly integrated, highly connected, low cost, low power platform. Along with other IP, full-custom mixed-signal blocks such as National's USB interface are essential for creating these platforms. When National decided to migrate this USB transceiver block to its latest 0.15 micron process, it needed the task completed quickly and reliably.

Project goals

In migrating to the new 0.15 micron technology, National needed to move quickly to deliver a high quality analog block for new integrated solutions. Yet, National faced a lengthy process with traditional manual methods. Indeed, the existing, manually crafted analog USB transceiver block presented a significant challenge by any measure.

“Full custom blocks like this, traditionally require a lot of manual layout work by experienced analog layout designers – a scarce resource today,” said John Gunther, Manager, Physical Design at National. “Implementing a design in a new advanced technology with new design rules makes the job even slower and more tedious.”

Rather than re-implement the block manually; however, National looked for a design tool solution that could migrate the existing full-custom analog design – and deliver results quickly, maintaining the highest quality.

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“Most of the circuits we need have already been implemented in a different technology,” said Gunther. “We could re-implement these full-custom circuits manually, but you can’t find enough highly-skilled layout designers to do it on time. So for us, finding an automated solution that could intelligently and quickly leverage these past efforts and re-use the physical design to re-map it to the new technology was highly desirable.”

The Challenge

In moving to the denser advanced 0.15 micron technology, National needed a tool capable of automating the layout migration and delivering hand-crafted quality. For the analog-rich USB interface block, these general requirements translated into specific needs to meet multiple analog-specific constraints including symmetry, device grouping, device and line matching, and proper recognition and sizing of all devices, including transistors, capacitors and resistors.

The Results

The National engineering team relied on Sagantec’s SiClone product with its additional analog extensions to automatically migrate the original 0.18-micron hand-crafted USB transceiver block to the new 0.15-micron process technology. The first tool to deploy simultaneous, n-level hierarchical processing technology, SiClone was created to deal with the challenges of hierarchical mixed-signal full-custom layout.

In migrating full-custom blocks, SiClone maintains the design hierarchy, recognizes all devices and sizes them according to the design requirements. Geared to hand-crafted mixed-signal blocks such as National’s USB transceiver, SiClone’s analog extensions meet all specific, demanding requirements of analog-layout migration.

“The SiClone result looked like it was hand-crafted,” said Gunther. “It addressed all our 0.15-micron design rules and was LVS and DRC correct. We spent just a few hours of manual touch-ups to get it 100 percent perfect. SiClone recognized and correctly sized all devices; it handled all symmetry, matching, grouping and contact strapping requirements; and of course, it maintained the hierarchy perfectly.”

The key difference, according to Gunther, lay in SiClone’s time and resource advantages.

“With SiClone, we get the same quality we used to get before with manual methods, but it takes one quarter of the time, and it doesn’t take up scarce analog designer resources,” said Gunther. “With Sagantec’s excellent support, you can count on getting the job done, dramatically cutting design time and effort.”

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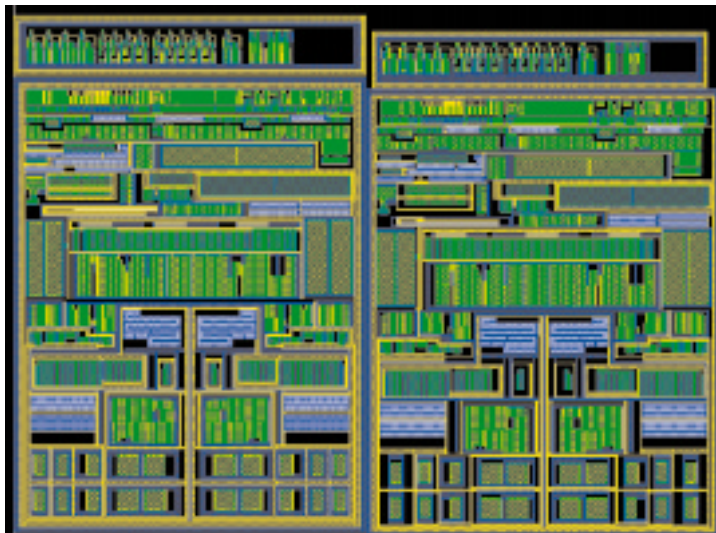


Figure 1: USB Transceiver source and migrated result