sondrel
Success through partnership

Case Study: An Automotive Sensor Chip for Electric Vehicles

RTL2GDSII Design Engagement

Overview

This chip design, for a leading supplier of sensor technology, is a big step forward in bespoke solutions for electric car manufacturers. The technology can be utilised to relay information from several key areas within a vehicle, for example as tyre pressure sensors, thermal management and temperature sensors and battery gas sensors. This specific design will sit within each car battery, providing an efficient safety mechanism to monitor and report on the status of each battery cell. Replacing existing technology with this new solution will also enable manufacturers to strip out more weight within the car.
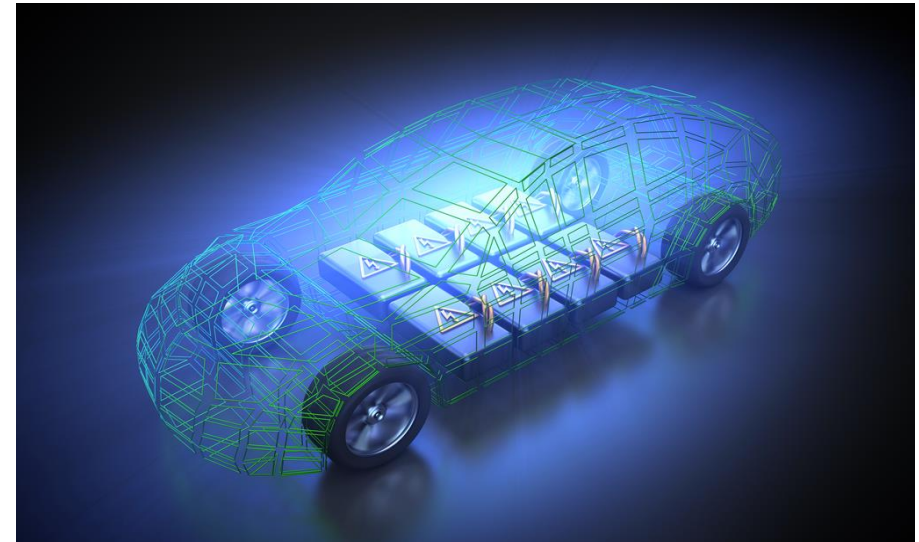
This second-generation design moved to a 90nm technology from 180nm, so that Flash RAM technology could be incorporated into the chip design. This enhanced the capacity of the chip to collect, store and process more data, and is an example of how more processing and functions are being incorporated into 'edge devices'.

This successful engagement was brought in on time and on budget.

Engagement Model

This was a nine-month fixed price ODC engagement, with the engineering team working out of our Morocco design centre. Sondrel provided the software tools and IT infrastructure.

The Sondrel Team held full responsibility for the project execution plans, synthesis, DFT, formal checks and the physical implementation, including all the signoff checks and power analysis.

Sondrel offers turnkey solutions from concept to fully packaged silicon as well as ODC solutions on a Fixed Price or Time and Materials basis.

The Solution

- Second generation design
- Process Shrinkage
- 180nm down to 90nm

The Design

- TSMC 90nm LP
- Frequency: 54Mhz
- Built around an Arm Cortex M3 CPU

Tools

- Synthesis: Design Compiler
- DfT: Tessent
- Equivalence checks: Formality
- Backend: Nitro
- Physical checks: Calibre
- STA: PrimeTime
- Power Analysis: Redhawk

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Technical Details

The principal challenge of this design was to address the timing requirements for the ARM CPU. It became apparent that the libraries originally supplied would not support the client's needs. Sondrel's experienced engineers worked with the client to advise and select the optimal balance of library cells to meet the timing without adversely impacting the speed and current leakage. Approximately 15% of faster high voltage threshold (HVT) libraries were used to successfully resolve the timing issue.

The project ran from a synthesis flow perspective. The engineering team effort concentrated on the following areas:

- **Synthesis**. This was managed by the Sondrel team, the customer having supplied the RTL and constraints. Sondrel provided the UPF based on the requirements from the customer. Feedback was sent to and discussed with the customer after analysing the synthesis results and timing reports.

- **DFT**. Structures insertion, verification, pattern generation and test engineering support were provided.

- **Backend**. The physical implementation completed by the Sondrel team starting from a proposed floorplan from the customer and followed by a set of sign-off checks including STA and physical checks.

- **Power analysis**. Power analysis was performed by Sondrel using a sign-off tool including Dynamic IRdrop, and EM analysis.

Next Steps

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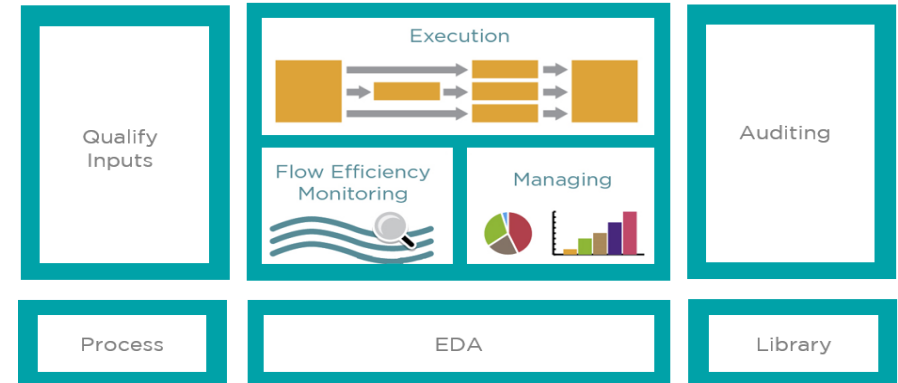
Process

Sondrel uses a proprietary design flow and methodology, Helium 8, that incorporates the specific targets and techniques to ensure that client requirements are met:

Framework Methodology

- *Partitioned into a number of discrete Phases*
- *Well-defined entry and exit criteria to ensure that at each stage data is correct and fit for purpose*
- *Well defined conventions, each designer knows Neon terminology*
- *Detailed and classified procedure documents*

Sondrel won the Queen's Award for Enterprise in 2008 recognising the value has for its Helium 8 and Neon Design Flow methodologies.