ASIC DESIGN & SUPPLY

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ASIC development for your product

Are you considering the development of a **custom IC**, exclusively developed for **your product** and fully tailored to **your needs**?
This brochure explains the basics of mixed-signal **ASIC (Application Specific Integrated Circuit)** design. Continue reading to explore if an ASIC is commercially viable for your company, and how ICsense can become a preferred partner for your ASIC development and supply.

Size, weight and cost reduction with increased performance and reliability

Why?

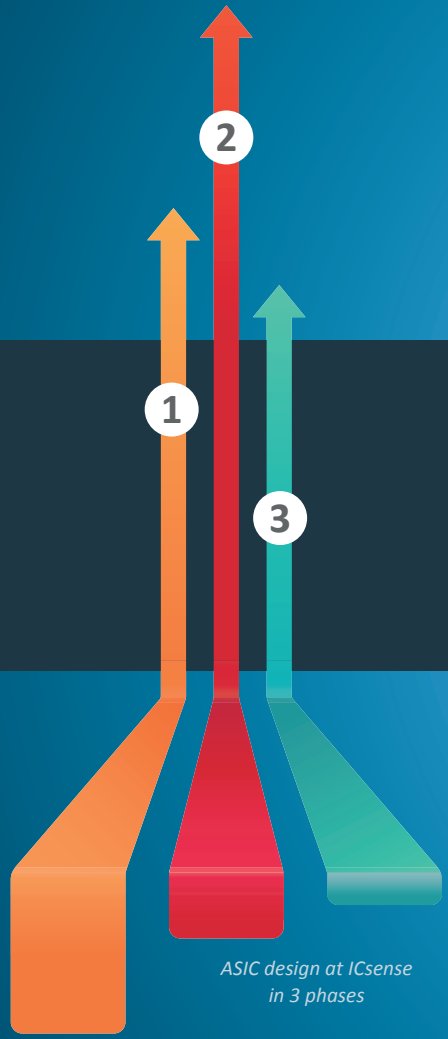
The development of your ASIC provides many different advantages. It can:

- reduce your product's bill-of-material
- offer flexibility for multiple product families
- protect your IP
- reduce your product's size and weight
- reduce test and assembly costs
- lower power consumption
- improve your product yield
- increase performance and reliability

How?

Every project is different;
however, an ASIC project generally
consists of three phases:

1. *Specification and architectural design*
2. *ASIC development*
3. *Qualification and production*



ASIC design at ICsense in 3 phases

PHASE 1

Specification and architectural definition

The purpose of this phase is to gather all information to allow you to evaluate your business case.

This basically consists of:

- the ASIC specification
- the ASIC unit cost
- a project plan and budget

The ASIC specification is the sign-off reference for the project. In this document, our engineers summarize the results of their in-depth study, which includes a feasibility assessment, optimal architecture with specifications, the rationale for these specifications, preferred technology, external components, assembly, test strategies (DFT=Design For Test) and risk mitigations. Our project team conceives the architecture and requirements in close cooperation and interaction with your technical team. They immerse themselves in all aspects of your system to arrive at a low risk, high-performance and cost-optimized ASIC solution. The architecture is always proven by extensive mixed-signal system modeling and simulations.

The ASIC specification and architectural design allows us to set up a detailed project plan, including NRE (Non-Recurring Engineering) costs for design, prototyping, test and production. We fix the total project cost at the end of this phase to minimize your financial risk.

ASIC unit cost is based on our area estimate, your product volume targets, the preferred package and the estimated production test time.

This information allows you to make your decision on whether to continue to an ASIC development with ICsense.

PHASE 2

ASIC development

In this phase, we execute the plan and architecture of Phase 1: the mixed-signal design and layout of the ASIC. Our engineers perform elaborate simulations over process, voltage and temperature (PVT) variations and statistical mismatch for specification compliance under all conditions. We take into account the (parasitic) effects of the physical implementation of your ASIC and of the system within which it is embedded.

After thorough verification and review, we begin the prototype fabrication: the tape-out. We choose the most cost-effective fabrication method that yields sufficient samples for statistical analysis. In parallel, we coordinate the development of the production test (ATE=Automated Test Equipment) hardware and software and develop prototype test boards in accordance with the test strategy (DFT). In addition, we provide all necessary information to embed the ASIC in your application.

When the silicon returns from the “fab” (this is where the ASIC is manufactured), we perform prototype tests in our measurement lab. The production tests are run in parallel to obtain statistical data. Full characterization of the ASICs over temperatures and supply voltages is done on the ATE tools to ensure a high yield and low ASIC cost. Finally, the ASIC is subjected to ESD (electrostatic discharge) and latch-up tests to ensure high reliability of the ASIC in the field. We cross-check the results of all tests and your field tests for full correlation.

You receive samples as soon as the first functional tests are completed. The functional ASIC prototypes can already be integrated in your application for demonstration purposes, field tests, pre-production series and so forth. We provide support to integrate and test the ASIC in your application.

After all tests have been completed, we continue to fine-tune the ASIC for optimal performance and cost-effectiveness, and resolve any outstanding issues in the prototypes. In addition, we offer the possibility to add new features or improvements to the ASIC based on your field tests.

After a short design and layout iteration, optimized ASIC prototypes are fabricated and the tests repeated to ensure full compliance with the specification. We also optimize the ATE program to further reduce production test time and thus ASIC unit price. The ASIC is now fully compliant and cost optimized, ready for qualification and production.

PHASE 3

Qualification and production

The purpose of this phase is to deliver tested ASICs in your target volumes. A Single Layer Maskset (SLM) is generated to start volume production. The ASIC is first qualified by means of an industrialization lot (of a few batches) and, depending on your volume, a skew lot. From the devices in the industrialization lot, we collect statistical data and freeze the production test limits. The skew lot is processed to prove the robustness of the ASIC over process variations and to guarantee the final yield.

Extra qualification tests can be carried out depending on the specific environmental operating conditions of the ASIC (“the mission profile”) and/or specific customer requests to ensure long-term ASIC compliance in the field. Every ASIC we provide is tested for compliance with the ASIC production-test specification, ensuring product success.

How "final" are your specs?

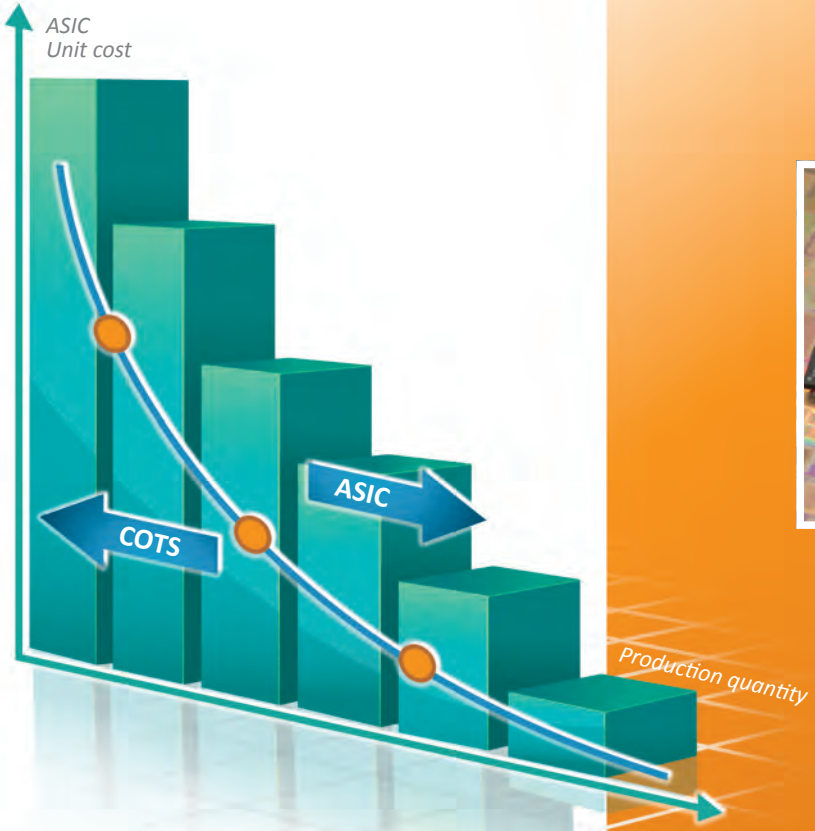
You do not need to have a finished ASIC specification before your project can commence. ICsense has a team of experienced senior designers and system architects to guide you through the final ASIC specification. We understand that many trade-offs exist and present them clearly to your team.

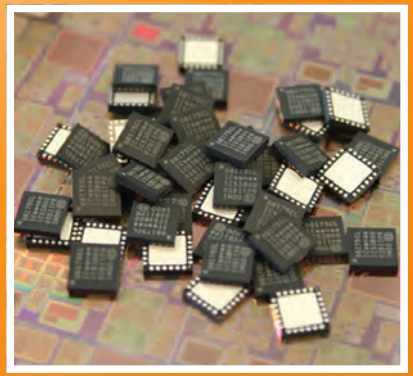
Is there a business case?

The development of an ASIC is an important strategic decision. ICsense can assist in business case validation based on the preliminary specifications your company has available. There is a break-even point between a COTS (Commercial Off-The-Shelf) and an ASIC implementation which depends on yearly volumes. Our business development team will assist you in this trade-off.

How long?

During initial discussions, we give ballpark figures on time frame. After the initial study phase, we present the detailed project schedule. A full ASIC development typically takes between 1.5 to 2 years. The bulk of the work is in Phase 2, and prototypes typically become available within the first year.





ICsense can assist you in defining your business case.

Why ICsense?

ICsense is the largest independent European IC design company in the field of analog, mixed-signal and high-voltage design. ICsense has a long and solid tradition in ASIC development and supply in the following four markets:

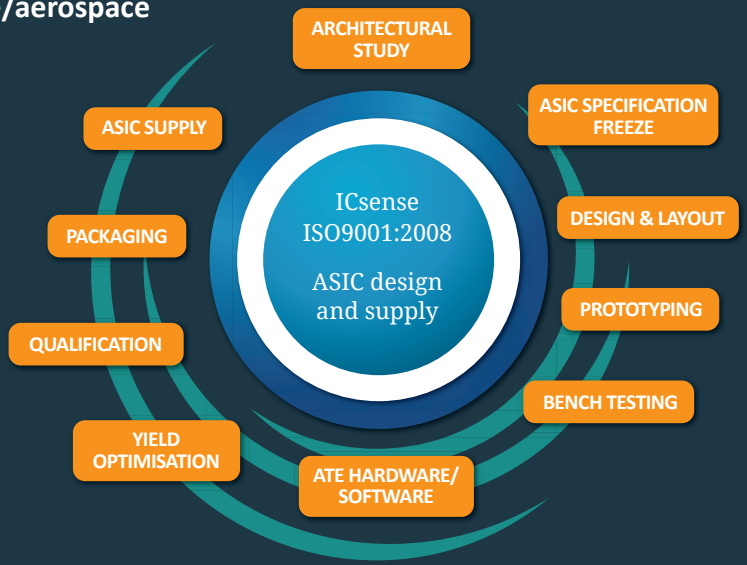
Industrial

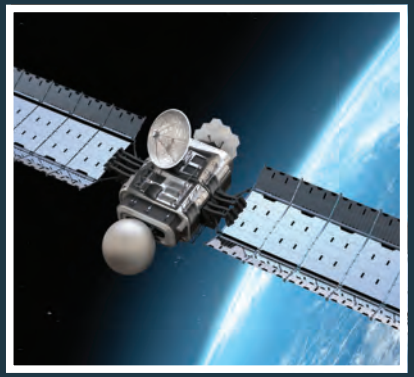
Automotive/aerospace

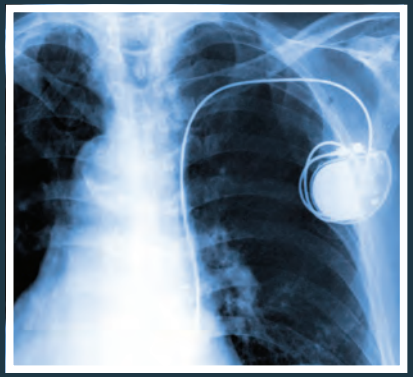
Consumer

Medical

Our **ISO 9001:2008** procedures guarantee low-risk, state-of-the-art ASIC designs.
Our expert **engineering team** is ready to guide you from your initial business case, right through to the final product. Involvement and commitment is what makes us stand out as a leader in our field.







From concept to product

ASIC specification: In the architectural study we ensure your ASIC is 100% suited to your needs. Moreover, we pay special attention to critical blocks to reduce any design risk in later stages.

High-quality foundry selection: We work with the world's top foundries to guarantee your ASICs are of the highest quality.

Design and validation reporting: ICsense is well-known for its open communication and close involvement. We document every phase of the design and commit to high-quality reports. Through bi-weekly reports, calls, and regular on-site meetings, we closely involve our customers in the design process. This ensures your ASIC is tailored to your product completely, and enables us to integrate your feedback as early as possible.

Bench testing: The engineers in our in-house lab analyze your ASIC on custom-designed test boards to verify whether your specifications are met.

ATE production tests and calibration: You will only receive Known Good Dies (KGD). Therefore, every chip is verified using a custom-developed ATE test program. As part of the ATE procedure, the chips are calibrated and custom-programmed according to your needs and product requirements.

Statistical tests (CPK) and industrialisation/skew lots: Before starting mass production, there is a pre-production phase. We complete our statistical analysis on a large number of ATE-tested samples to guarantee high yields and low ASIC unit prices. During skew lots, process variations are deliberately introduced to push the ASICs to their technical limits. This guarantees product robustness over its lifetime.

ESD and latch-up tests: These tests are performed to ensure your ASIC's high reliability.

ISO 9001:2008 procedures and project management: The internal project flow is subject to ISO 9001 procedures. We use version control and issue tracking software to ensure our deliverables meet the highest quality. ICsense assigns a single point of contact to your project and manages the complete cycle, from initial study to your ASIC in mass production.

Locations

For more information on high quality and low risk ASIC design, please contact our sales department.
We look forward to discussing your needs and exploring the possibilities together.

www.icsense.com

ICsense NV

Arenberg Science Park
Gaston Geenslaan 9
B-3001 Leuven
Belgium

Tel. +32-16-58 97 00
Fax +32-16-58 97 20
info@icsense.com
www.icsense.com