Case studies

CASE STUDY

2.5G PMU for Mobiles optimized for handset and handheld devices

CUSTOMER NEEDS

- Extremely low power and low quiescient current consumption;
- Thermal dissipation

COMPETENCIES & SOLUTIONS

- Battery Charger
- 8 Linear Regulators
- DC/DC Step DOWN (1.8V / 300mA Internal Switches)
- 3 x Very Low Noise & High PSRR LDO regulators
- Temperature & Voltage Supervision
- Vibrator & Buzzer Driver
- Driven by Button
- SIM Interface
- Very Low Current
- Consumption in Sleep Mode
- BGA49 5x5mm

SUCCESS FACTORS

- Power consumption optimized with a top-down approach from Voltage Supply domains architecture to inherent lowest possible cells current consumption
- Introduction of stand-by mode and sleep modes for better energy battery management
- Dedicated layout architecture for power transistors
- Suitable floorplan of the IC to distribute heat dissipation across the available surface

DETAILS ON CUSTOMER NEEDS

After the September 11 attacks, there was a need to develop a new ASIC for National Security, specifically for new "walkie-talkies" with requirements for an **ASIC that consumed little power** (thus extending battery life) and that had **low thermal dissipation** to avoid large and bulky heat sinks. Therefore, the resulting device (similar to a mobile phone) had to be small, slim, and energy-efficient.

TELECOMMUNICATIONS

CASE STUDY

Advanced ASSP PMU for Solid-States and Flash Drives

CUSTOMER NEEDS

- Small area
- Hign efficiency
- State of art Power management section
- Explore all different solution in term of architecture to find the best IP candidates;
- Innovative digital controller in DCDC Buck Converters to reduce losses during switching time and transition time(Pulse Skipping / PFM / PWM)

COMPETENCIES & SOLUTIONS

- 5 DC/DC Buck Converters
- 1 Low Drop Out Linear Regulator
- Temperature & Voltage
- Supervision
- Very High Efficiency at light load conditions
- Extremely low Quiescent Power Dissipation
- Serial Interfaces

SUCCESS FACTORS

- accurate partitioning of the functionality across the blocks
- top-down approach for IC layout with clever assignment of available area for Ips
- advanced techniques for the layout of the power transistors to insure respect of electromigration rules together with smallest possible area
- close cooperation with the technology & device development group to introduce safe waivers to reduce transistors area

OTHER DETAILS

The initial input here was a 'state-of-the-art' project (high-performance with a small area, resulting in a requirement for high efficiency, achieved with a new controller).

GEDEC acted in this project as Project Leader, co-designing with the ASIC manufacturer.
A derivative became a standard product, which is still in production.
It was the first PMIC for SSD (Hard Disk) drives.

TELECOMMUNICATIONS

CASE STUDY

Pre driver chip for Solenoid Direct Injection

CUSTOMER NEEDS

Development of an ASIC for the Solenoid Direct Injection application, including:

- High side and low side pre drivers for external NMOS switches
- Quasi resonant DC/DC boost converter
- OC detection circuit for each of the external NMOS
- Internal diagnostics to detect open load, short circuit to GND and short circuit to battery
- Real time signal conditioning of injector current and voltage

COMPETENCIES & SOLUTIONS

- Accurate programmable sourced/sinked current for the high side/low side pre drivers
- Very fast current sense detection and drain monitor for the DC/DC converter
- Very fast OC detection for the external NMOSFETs, using floating architectures for the high side control
- Accurate real time signal conditioning of injector current and voltage

SUCCESS FACTORS

- Cooperation with customer in order to understand its needs and critical topics of the design
- Consolidated design flow able to successfully simulate the behavior of blocks specifically designed to meet customer needs
- Care to design for testability, reliability, EMC, ESD and latch up robustness, safety

> Microtest has a long experience in the development of ASICs for automotive applications, following ISO 26262 and meeting customers needs in terms of integrated blocks, consumptions, speed

AUTOMOTIVE

CASE STUDY

DSI3 transceiver for surround view applications

CUSTOMER NEEDS

- 12 bidirectional and independent DSI3 transceivers
- Two gate drivers for external PMOS switches, used to supply two banks of sensors
- Proper diagnostics for the external switches, as open load, short to battery, short to ground, fast overcurrent detection
- Dedicated regulator for the internal supply of DSI3 transceivers in order to reduce internal power consumption

COMPETENCIES & SOLUTIONS

- Development of a transceiver compatible with DSI3 protocol and compatible with new generation low leakage sensors
- Innovative solution for the external switches gate driver, including soft start
- Innovative solution for the fast overcurrent detection, using floating circuits
- Redundance and extensive monitoring implemented for safety according to ISO26262

SUCCESS FACTORS

- Choice of the best circuit architectures to reach customer requirements
- Detailed validation of innovative solutions using a consolidated design flow taking into account also testability, reliability, layout effects
- Care on EMC issues

> In the automotive market, electronic systems strongly help to improve safety. Purpose of this ASIC is to manage DSI3 ultrasound sensors used for park assist

AUTOMOTIVE

CASE STUDY
16 independent channels transceiver

CUSTOMER NEEDS

Development of an ASIC for the Microtest ATE application, including:

- 16 independent high voltage (200V) ultra low leakage switches
- Configurability of the switches turning ON/OFF speed
- Very low current consumption
- Dedicated one wire communication with configurable speed to command the switches turning ON/OFF
- Strong robustness of the switches versus OV and UV events

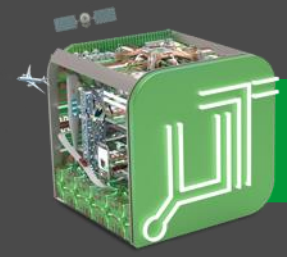
COMPETENCIES & SOLUTIONS

- Choice of an innovative architecture for the switches, able to reach the ultra low leakage requirement
- Care to low power in the design of all internal blocks
- Design of an innovative low supply connection to guarantee strong robustness versus OV and UV events on the switches

SUCCESS FACTORS

- Use of a BCD SOI technology to reach the high voltage requirement
- Strong cooperation with application in order to realize the best design customization for the ATE needs

> Microtest is a leader in the ATE market also due to the development of strategic ASIC used inside its ATE, letting Microtest ATE to achieve unique and strongly competitive performances



MICROTEST ATE

CASE STUDY

Power supply ASIC for Engine Control Units

CUSTOMER NEEDS

- 5V and 3.3V linear regulators
- 4 tracking regulators
- A configurable 1V buck regulator
- A switching pre regulator with boost and buck stages
- Two configurable drivers for external high side/low side
- Possibility to drive the second low side in DSO mode (Direct Switch On)
- Standby mode with a standby supply for external memory and with Engine Off Timer

COMPETENCIES & SOLUTIONS

- Custom management of the configurable drivers supply, taking into account also the DSO mode
- Management of three logic domains (main functional, standby and DSO mode), and definition of a proper testing strategy
- Design of linear regulators and buck regulator stable with a wide load current and robust to ATE parasitics
- Design of pre regulator buck stage stable with a wide input voltage range

SUCCESS FACTORS

- Extensive use of top simulations to validate different wake up strategies and different standby /main functional scenarios
- Use of post layout simulations to optimize the buck regulators design
- Care on EMC in the floorplan of noisy and sensitive blocks

> The electronic control of the car engine helps in increasing efficiency and reducing emissions. This control unit needs proper supplies, that can be efficiently provided by a dedicated ASIC

AUTOMOTIVE

CASE STUDY

3D Image Sensor Time-of-Flight single-chip optimized for augmented reality

CUSTOMER NEEDS

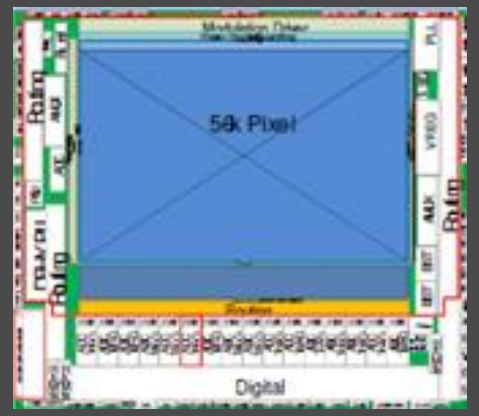
- 3D Time-of-Flight imager fron end design
- Low power design for mobile application
- Array of 16 ADCs, 12b conversion for imager data accurate acquisition – internal accurate voltage regulators

COMPETENCIES & SOLUTIONS

- Analog front end low noise
- Low power acquisition system
- ADC conversions
- matrix solutions
- analog layout 16 ADCs matrix development

SUCCESS FACTORS

- deep know how on low power design
- custom analog layout



CASE STUDY
Laser Eyes for Car application (LiDAR)

CUSTOMER NEEDS

- Analog fron end design for a TransImpendance Amplifier (TIA)
- Very low noise design

COMPETENCIES & SOLUTIONS

- Analog front end low noise
- low power high bandwidth design
- custom physical layout

SUCCESS FACTORS

- low noise design with input bipolar transistor stages
- custom analog layout design –


MICROTEST
breakthrough innovation
GROUP
THANK YOU