A mix-signal radhard micro-controller : the DPC

Noordwijk ESTEC,
Dec 8th, 2014

Outline

- Organization
- Architecture
- Emulation
- DARE library
- Analog functions
- Die view
- Conclusions

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Organization

ThalesAlenia Space

- Prime contractor
- Management
- Specifications
- Digital Design
- Top-Level Simulations
- Functional Testing

esa

- Management & followup
- Technical Advises

imec

- Microelectronics Integrator
- DARE Library provider
- Digital Place& route
- Layout integration
- Manufacturing & Packaging
- Electrical Testing
- Batch Validation.

ICsense THE IC DESIGN COMPANY

- Analog Building Blocks design
- Analog Layout
- Mixed-mode simulations
- Performance Tests

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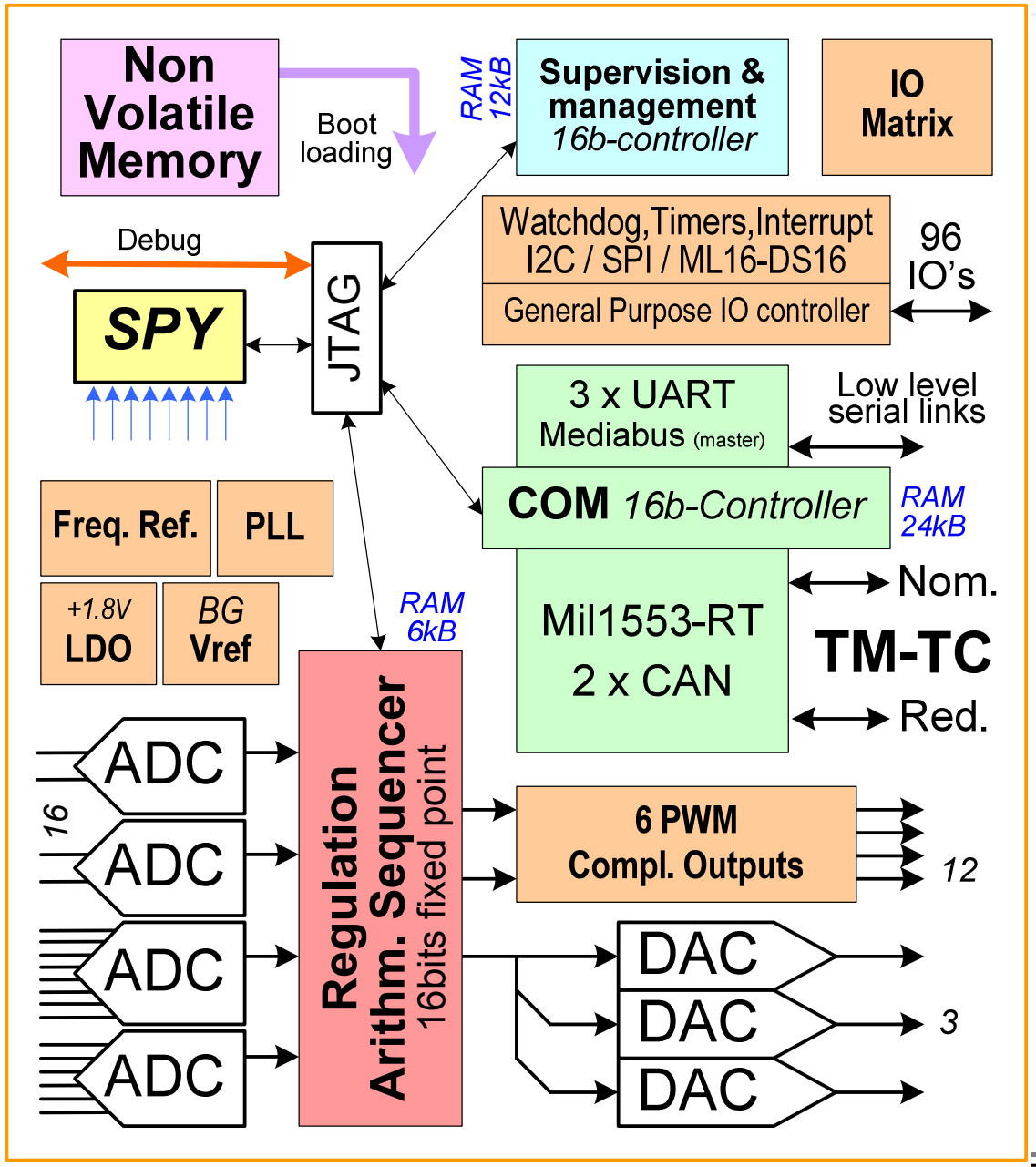
Architecture



On chip :

- 16bits OpenMSP430 CPU
- 42K memory
- RC oscillator + 120MHz PLL
- LDO +1.8V
- Bandgap
- 13bits ADC + input MUX
- 12 Bits DAC

Off Chip:

- E2prom
- +3.3V regulator

DARE on UMC 0,18µ

CQFP 256 pins

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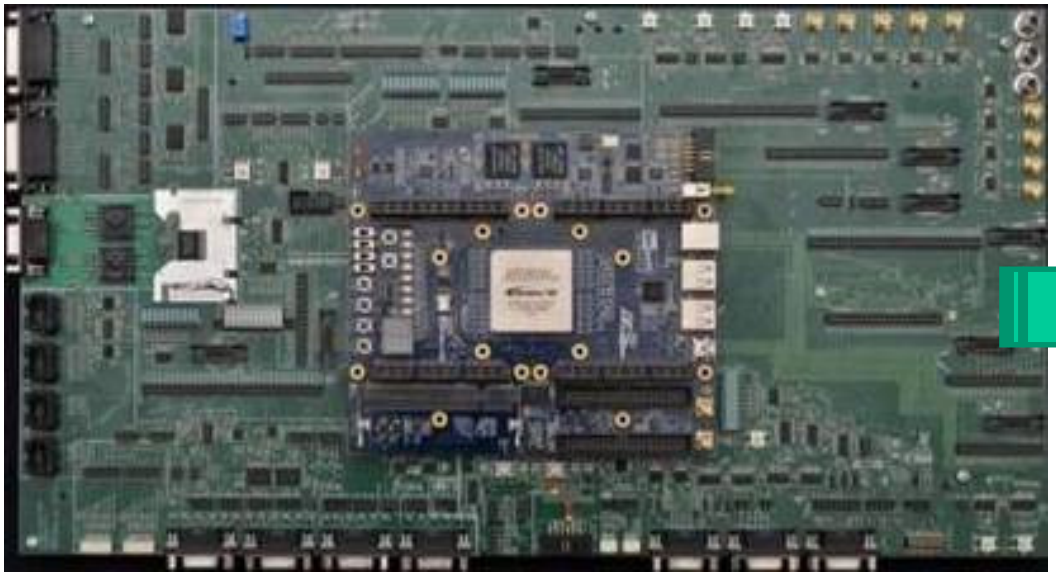
Emulations on target applications



Core Validation BreadBoard

- All Functional modes
- Digital Interfaces
- SW development suite
- Debug & Spy functionnalities

Designer Starter Kit

- Early integration into equipments
- Analog Interfaces
- Application SW

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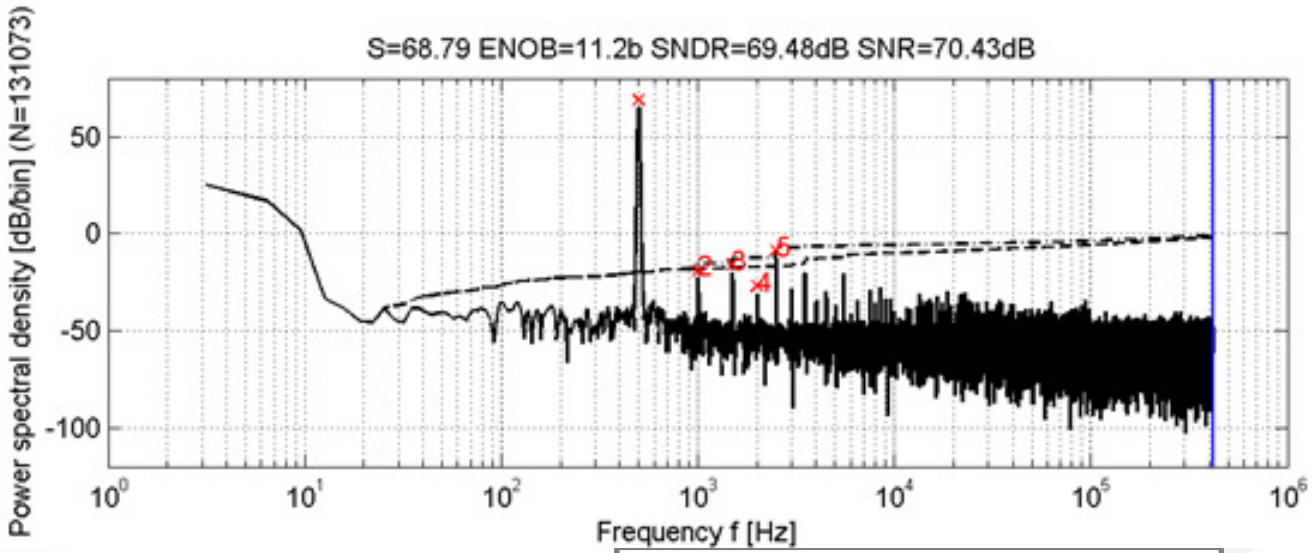
- Selected library DARE on UMC 180nm
- DARE+ library enhancements
  - Clock gating cells
  - SET optimized clock and set/reset trees
  - Dual Port SRAM
  - Slew rate controlled IO
- Advanced Characterization tool (Altos)
- Analog Design kit

Analog functions

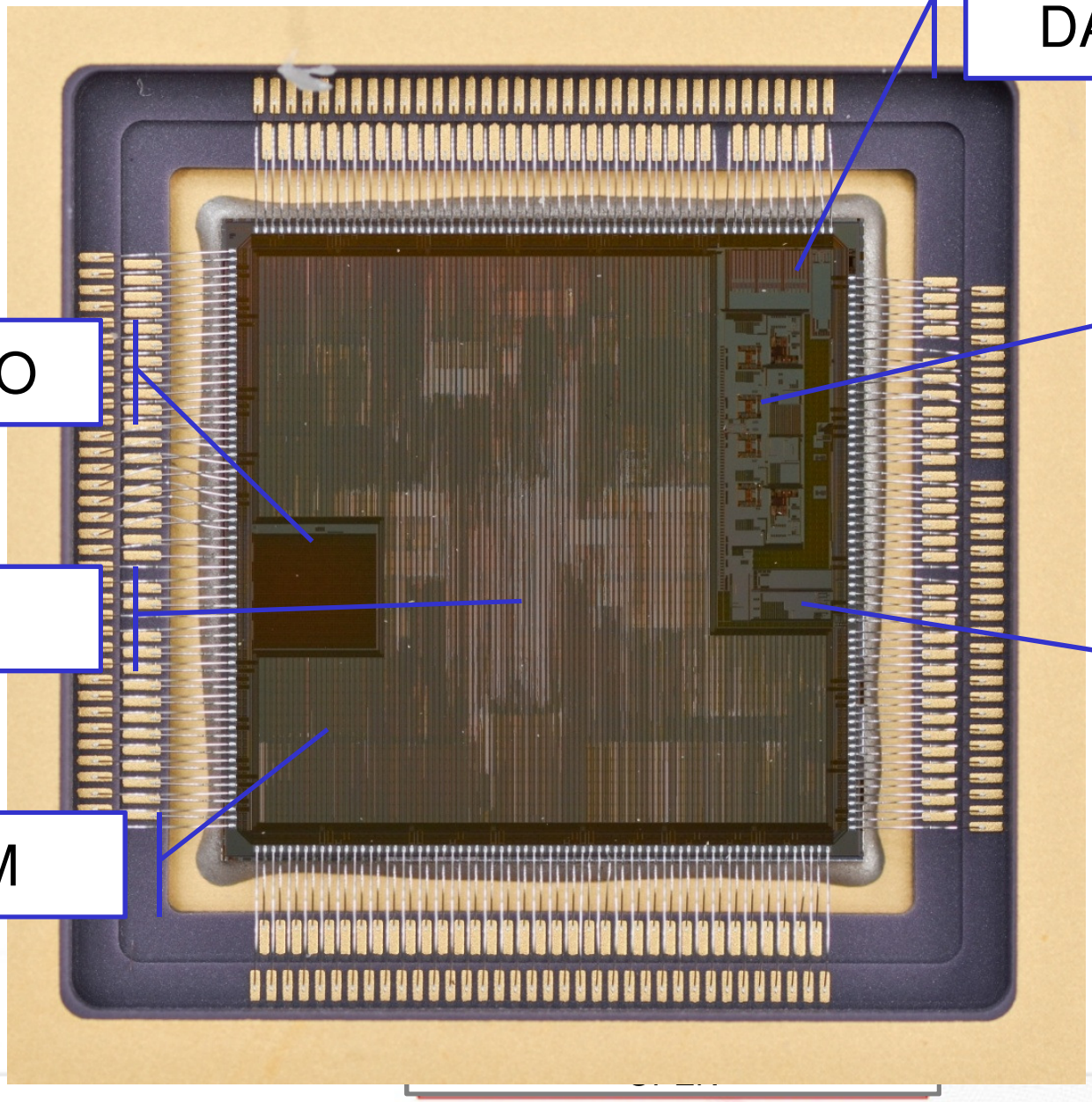
- 1V Bandgap Reference voltage and current generation
- Power-management block with LDO's
- 120 MHz frequency reference system (PLL) to provide the clock to the digital part
- 100kHz reference oscillator
- 4 flexible 13 bit , 1MSps ADCs with extensive input muxing capabilities
- 3 12 bit, 3.75 MSps DAC current-mode outputs
- Power-on-reset circuit and under voltage detector
- Rail to rail comparators, PGA (0dB, 10dB, 20dB)



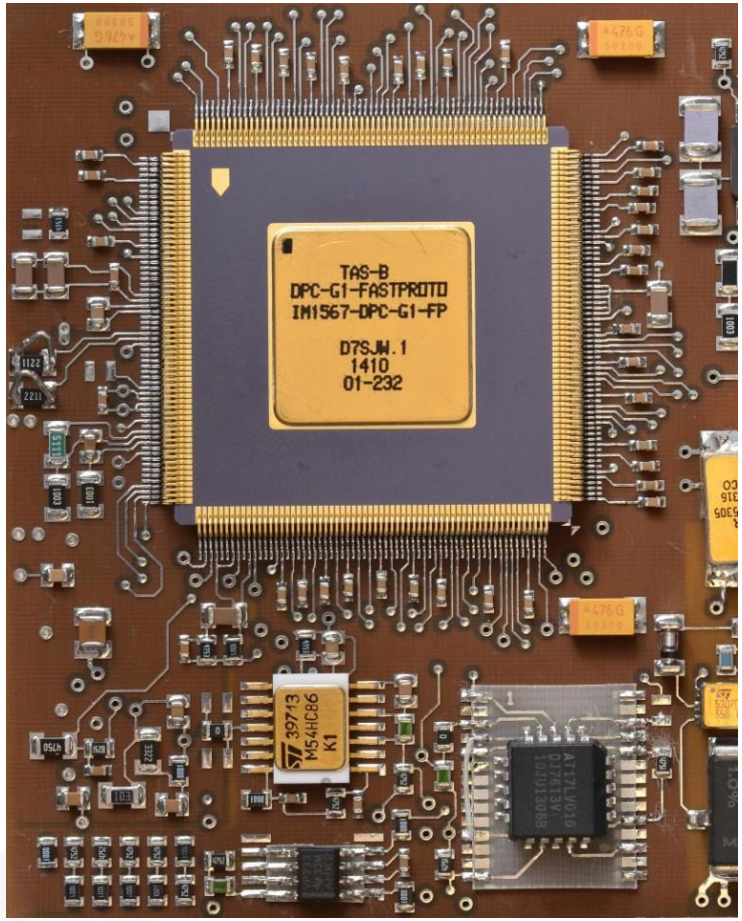
60MeV.cm²/mg

SET check :
Systematic 1.2pC

DPC : die view



Conclusions



Generic & Versatile
* Programmable
* Configurable

Mixed mode / all analog functions on chip

Rad hard & European

Feature list OK ☺

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