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GaN ready single chip DC-DC controller for space applications

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Thales Alenia Space has partnered with MinDCet (IC design house) in an ESA program for the development of a single chip dc-dc controller. The IC design was done on SOI and high voltage process.

The component includes all classical features required for the control of a dc-dc converter, allowing it to control a multitude of topologies.

- Current sensing amplifier with edge blanking, error amplifier and voltage reference
- PWM controller with 3 modes of operation: peak current control, average current control and finally also the innovative Peak & Valley current control (PVCC) proposed by ESA
- Various protections: over-current, over-temperature, over-voltage and under-voltage
- Reference oscillator with external synchro input.

One of the most innovative features is an on-chip high voltage (up to 100V) input. This input delivers power during the transitory startup phase of the dc-dc converter. Super-junction 200V transistors are being used which have shown satisfactory robustness to radiation effects: total dose up to 60krad & 62 MeV.cm²/mg heavy ions.

Opposed to most commercial dc-dc controller ICs, the complete low-level control subsystem is designed with 5V transistors. Within the constraint of a low bias current (DC-DC efficiency), this architecture allows reaching high bandwidths and high speeds to be able to control high frequency GaN based dc-dc converters.

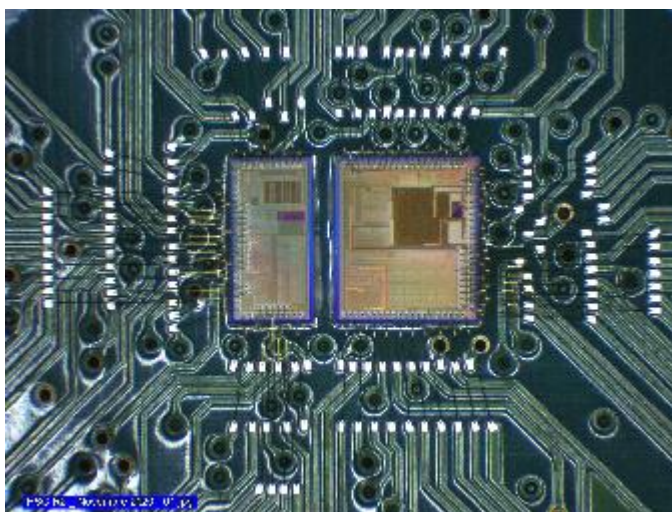


Figure 1: Run2 of DC-DC controller for Space applications

Controller run1 was developed and tested in the frame of a VLAIO (Flemish regional) project. The aim was to achieve integration of high voltage super-junction transistors into space radiation hardened ICs.

Controller run2, was developed & tapped-out in development under an ESA GSTP program. Formal qualification for Space is reaching its end. The component Plastic BGA has now been successfully included in several dc-dc converter applications.



Figure 2: HSC PBGA package for Space applications

Early samples of the component will now become available for any European dc-dc designers. MinDCet will perform component distribution and customer support.