SPACE IC

High-reliability integrated circuits

3rd Place 2017 Airbus Defence and Space Challenge

SME Industry Space Days esa INNOVATION AWARDS 2014

Voltage Clamp IC for Protection, Regulation and Mitigation of Failure Propagation

AMICSA 2021

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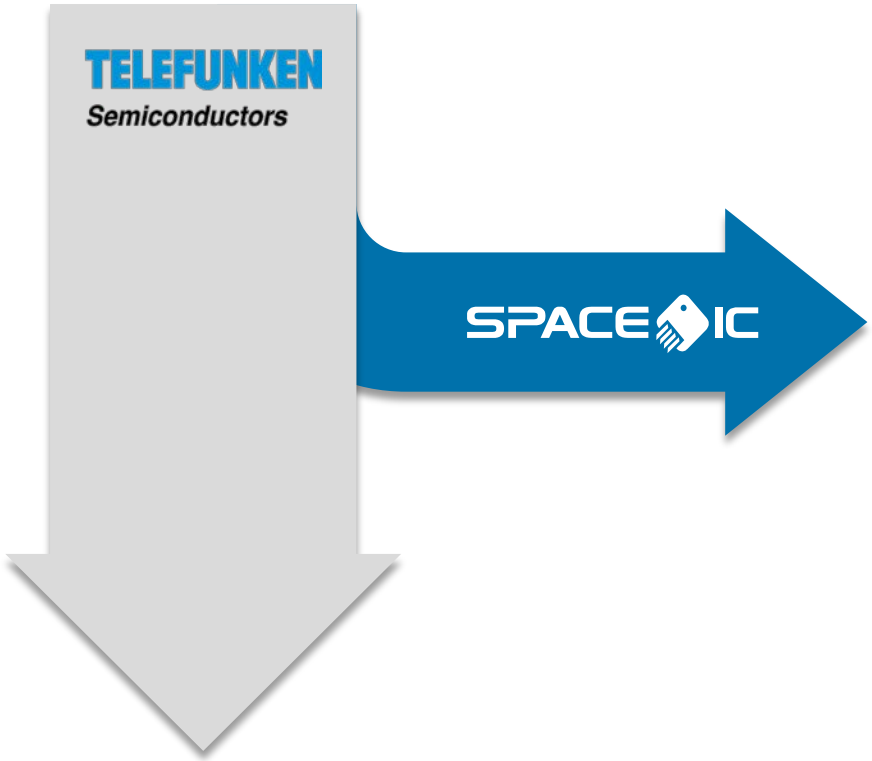
Uwe Gieselmann ▪ André Rocke ▪ Jürgen Beister

Company

- Foundation of **SPACE IC** in 2014 by experts from the TELEFUNKEN IC product development
- **SPACE IC** exclusively takes over development and manufacturing of **rad-hard IC products** from TELEFUNKEN



Founder Team & Management Board:


V. Burkhay


U. Gieselmann


M. Reuter


A. Rocke

Headquarter:

SICAN Technology Park in the Northwest of Hannover, Germany

Overview

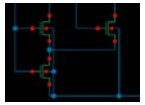
Technical and Application Focus

- Space-Grade Analog and Mixed-Signal Integrated Circuits for **Power Management** and **Robust Data Interfaces**

IC Product Development

Chip Development:

- IC Spec
- IC Design
- Package Design
- Prototyping

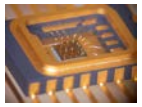



Testing:

- Screening
- Evaluation
- Qualification

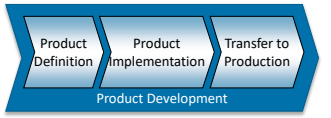

Manufacturing:

- Chip Foundry
- Wafer Test
- Dicing
- Assembly
- Screening
- Qualification Testing

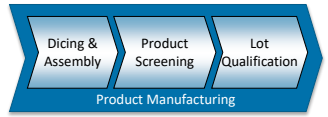



Service:

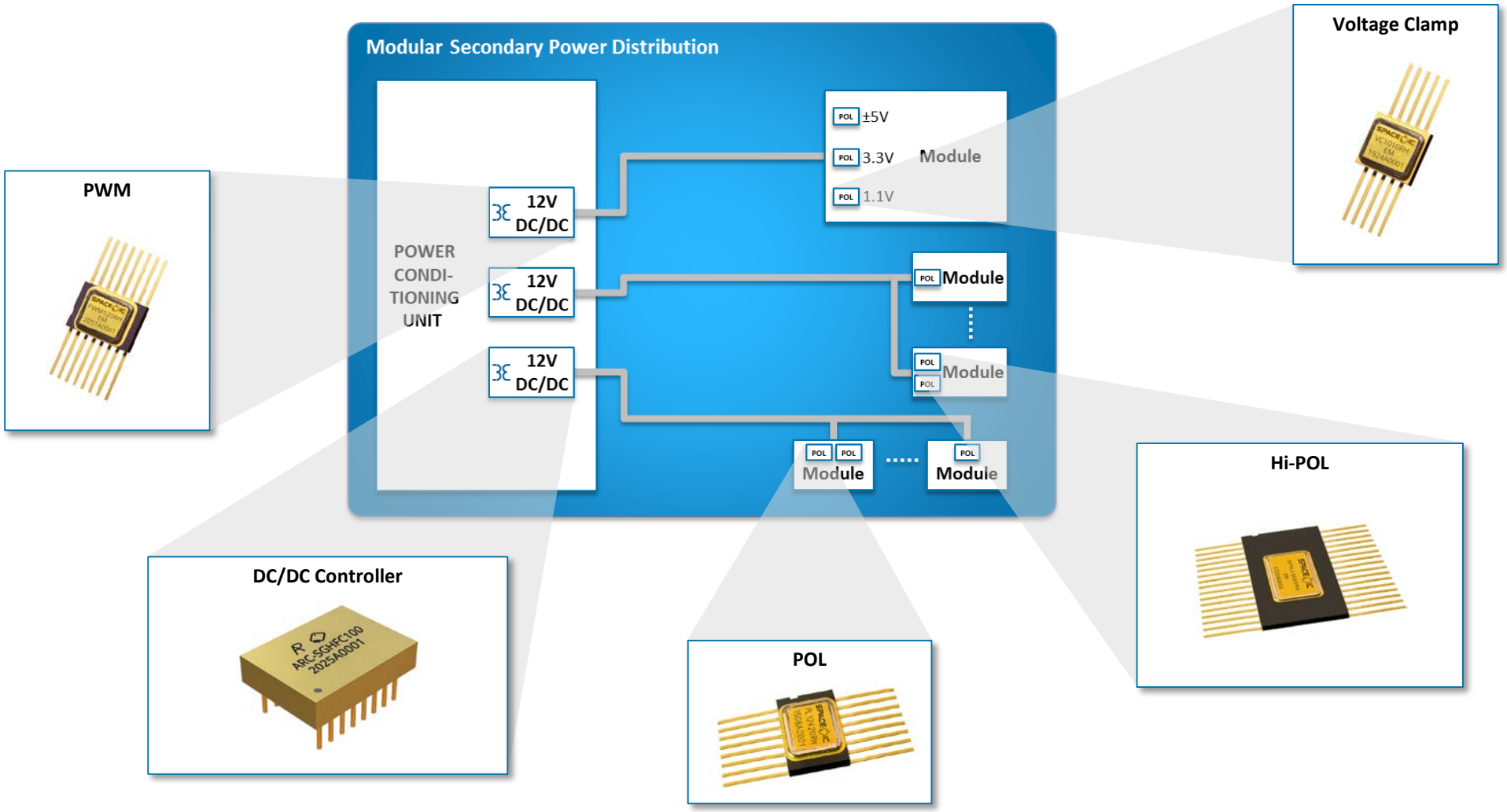
- Mixed-Signal ASIC Service



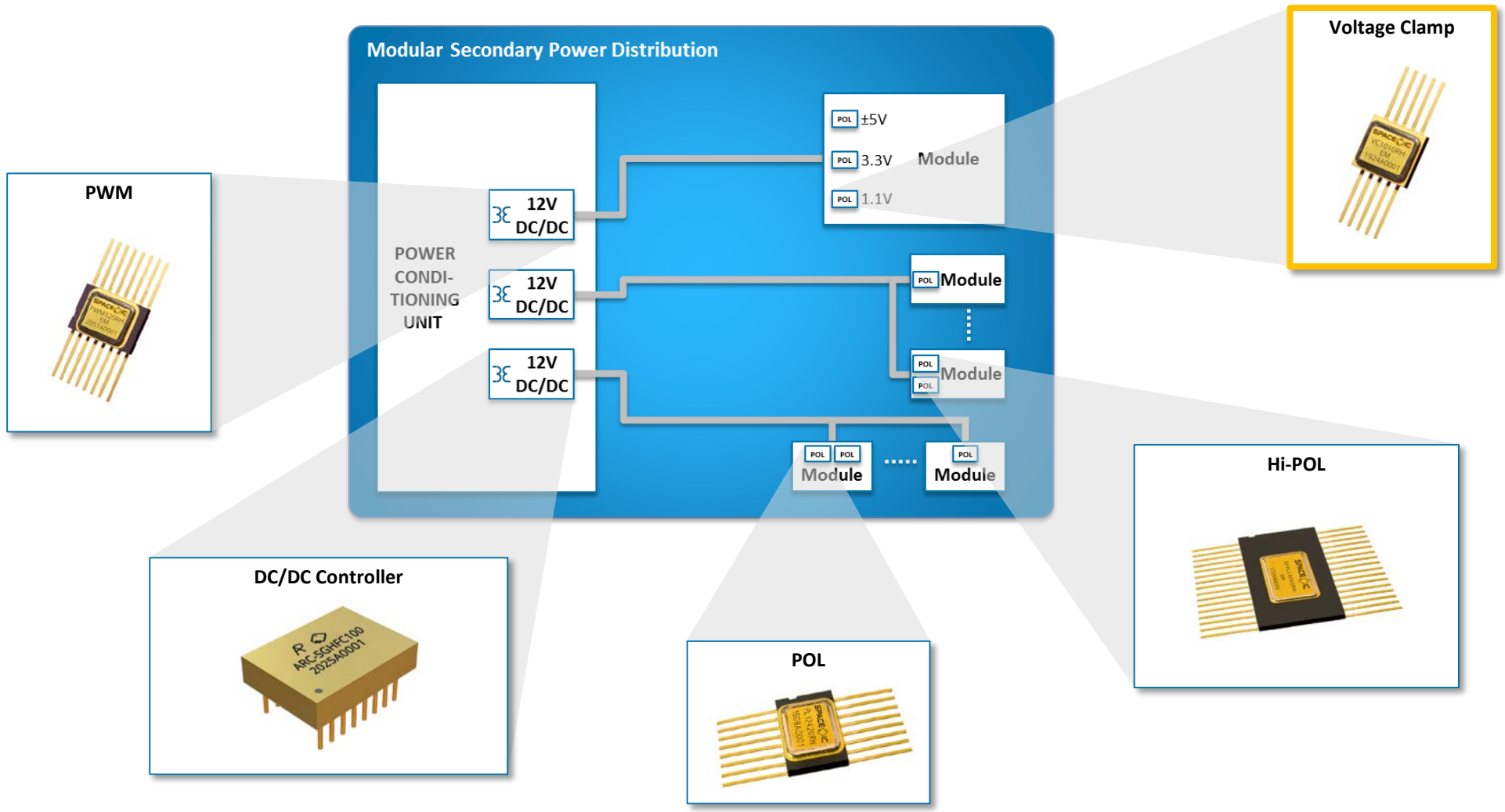
- Manufacturing Service



Power Management Products



Power Management Products

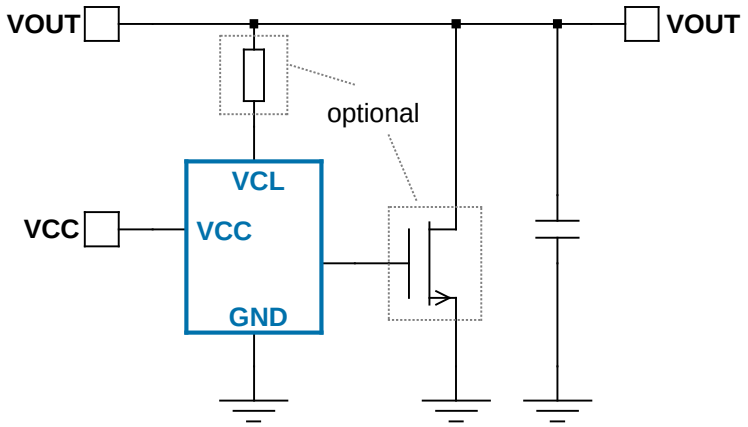


Voltage Clamp Design Target

Redundancy DOES NOT necessarily ”resolve” propagating failures!

Voltage clamping protection component is desired

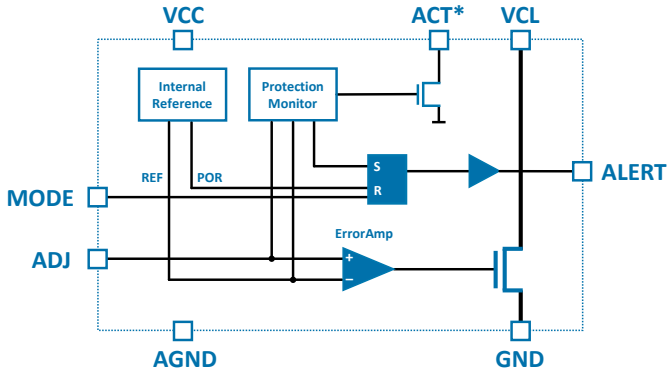
- Discharges actively the node
- Faster reaction, than linear regulator
- No function interruption at OV events
- Can be used in combination with LCL



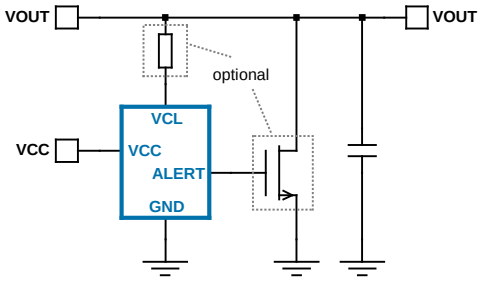
Voltage Clamp IC

Monolithic adjustable shunt voltage regulator:

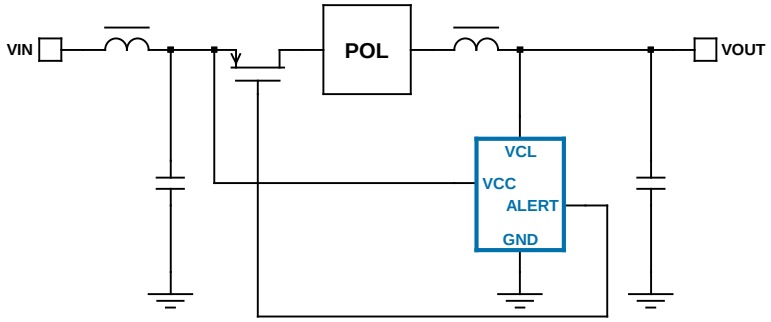
- 10A shunt regulator, > 10V adjustable clamp voltage
- > 18W power dissipation capability (10ms)
- Stand-by current consumption < 200µA
- OT, OC and OV detection
- Configurable ALERT output
- Radiation-hardened by design



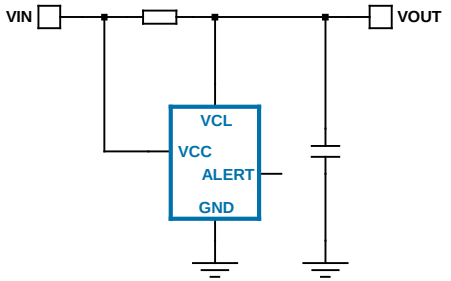
Voltage clamp:



POL protection:

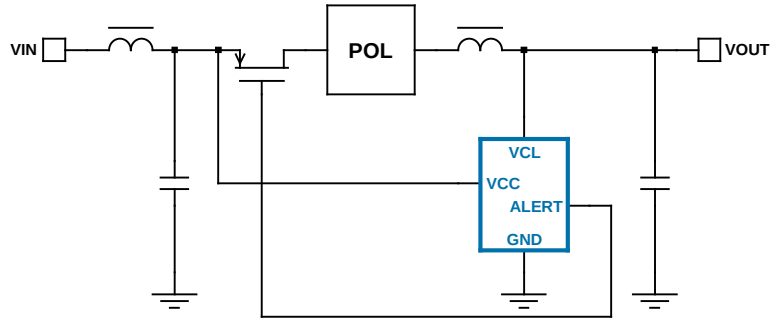


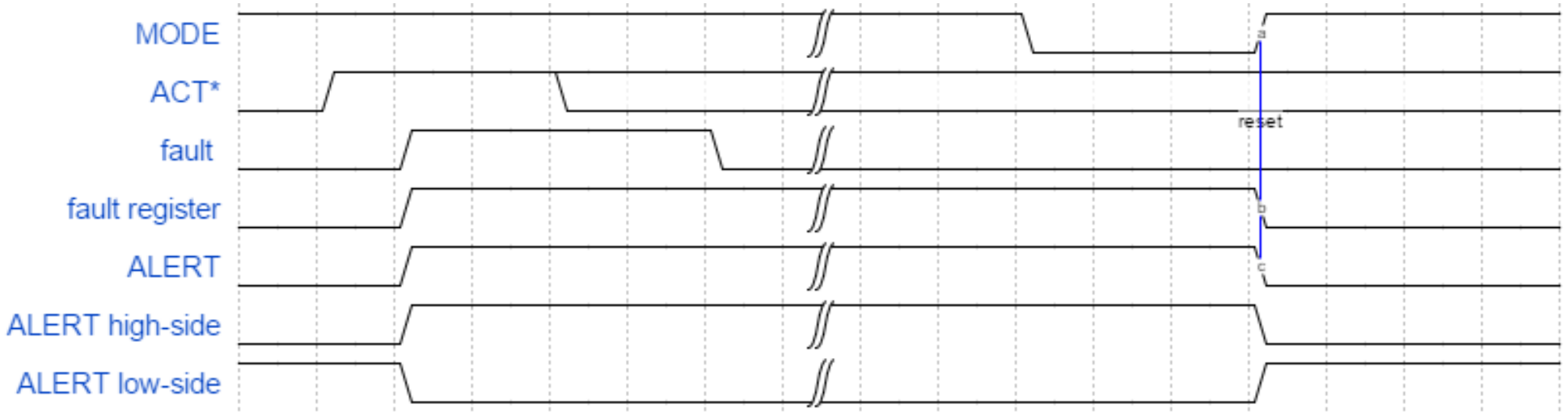
Voltage regulator:



ALERT Logic

Detection Mode	MODE Input	ALERT Output	Latched
Latch mode	HIGH	push-pull	YES
Flag mode	LOW	open-drain	NO



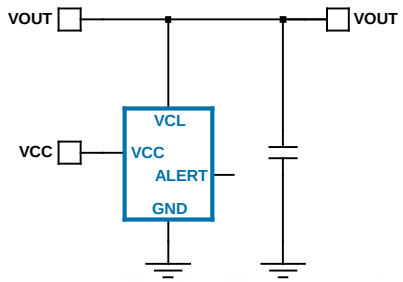


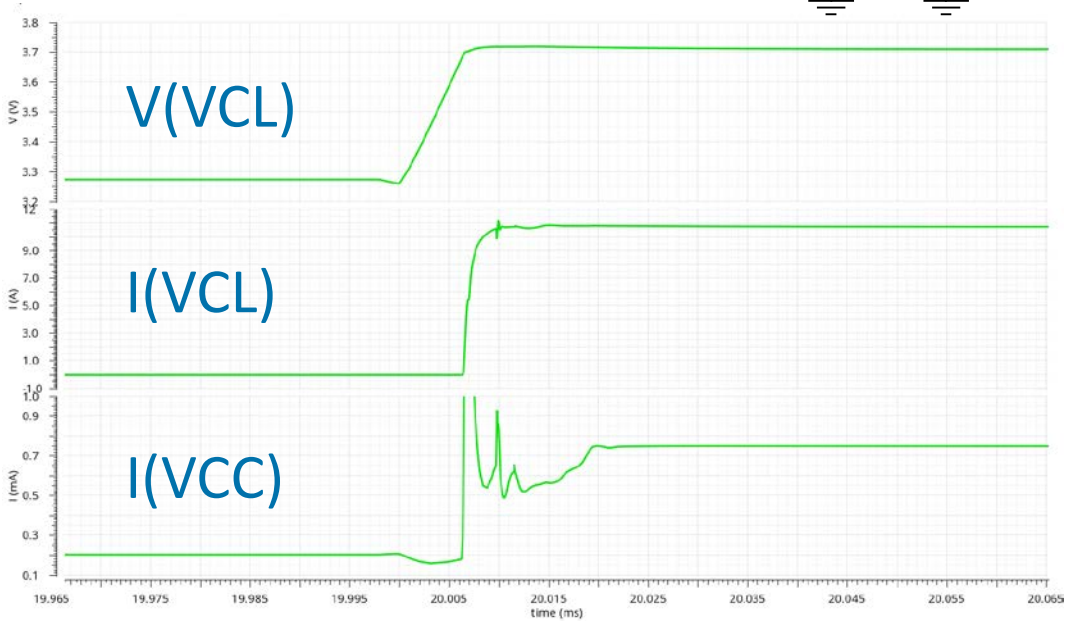
Electrical Characteristics

Overvoltage Event

Voltage Clamp:

- Fast reaction 1µs to 10µs
- Precise clamping

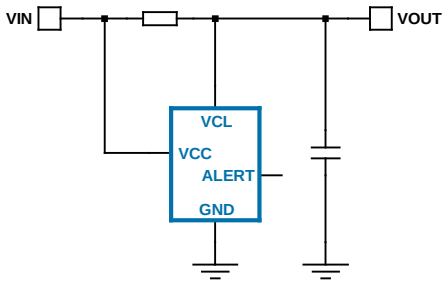


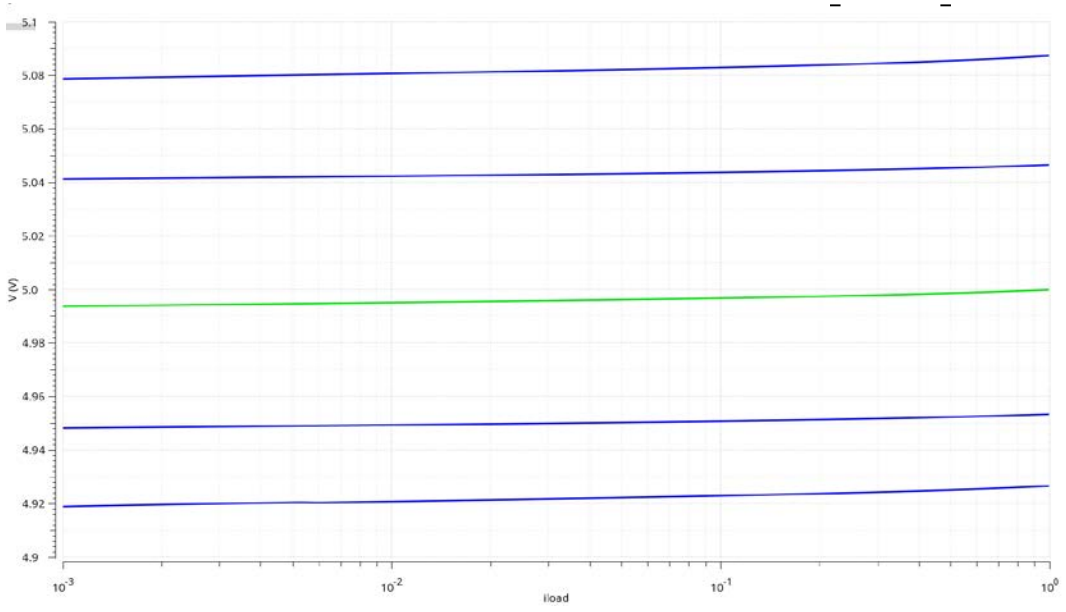


Load Regulation

Voltage Regulator:

- Corners simulation
- Load regulation < 0.1%/A



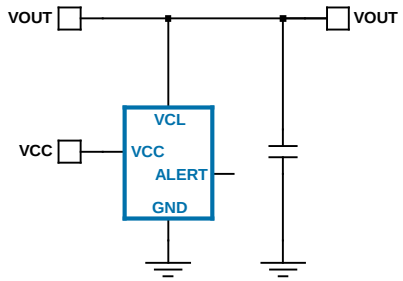


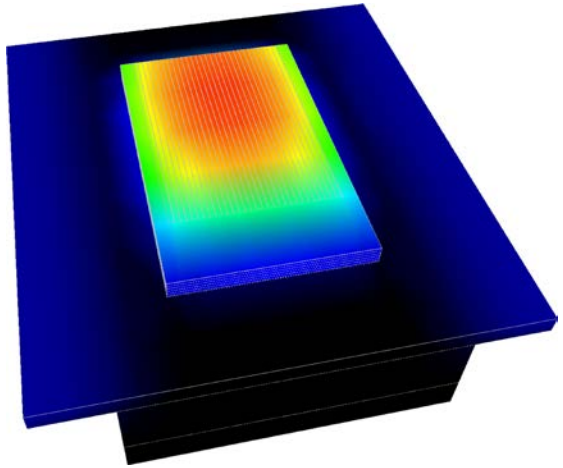
Thermal Design

Dynamic Event

Voltage Clamp:

- Short-time power absorption
- 18W power @ 10ms
- Power completely absorbed in chip die



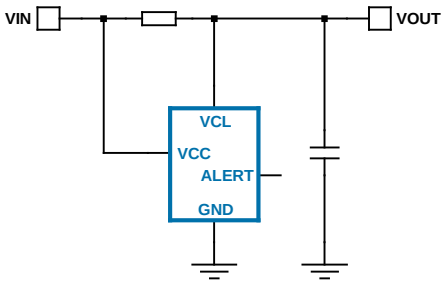


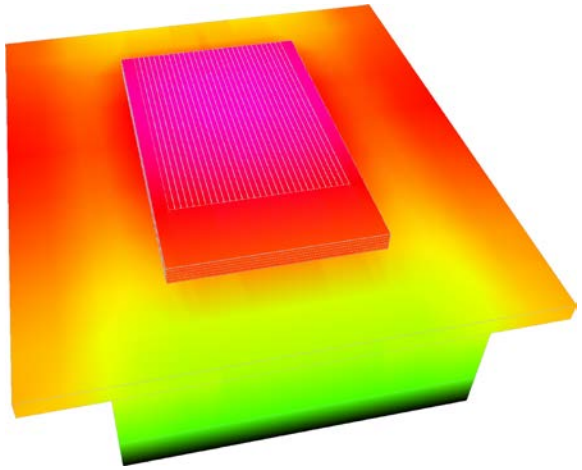
ΔT = +32°C
at die surface hotspot

Static Regulation

Voltage Regulator:

- Continuous power absorption
- 2W power steady-state
- Thermal flow via heat sink glued to pcb

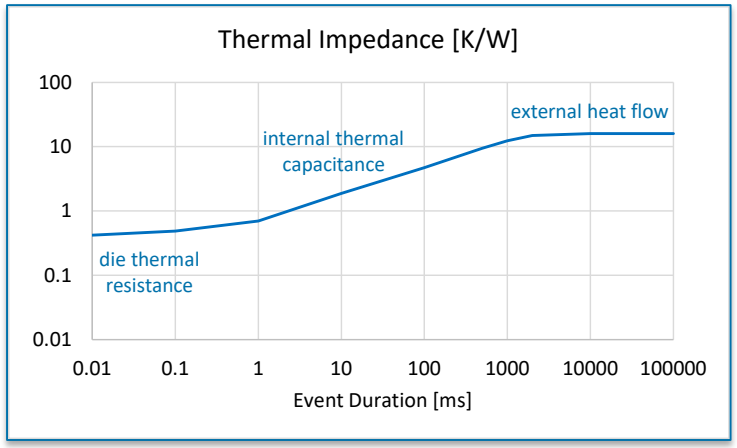


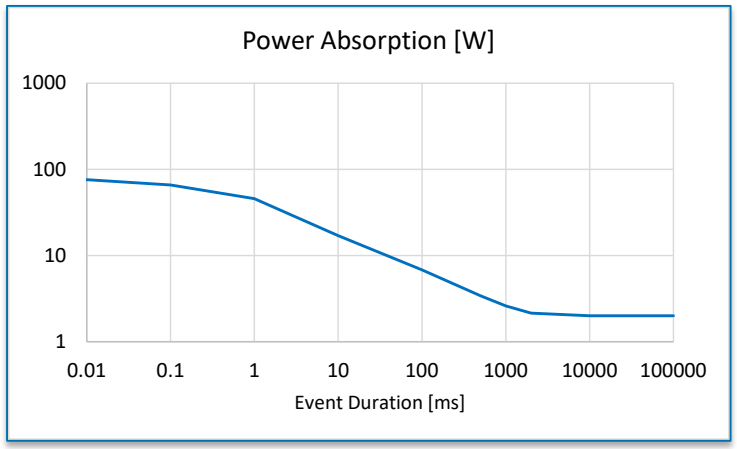


ΔT = +32°C
at die surface hotspot

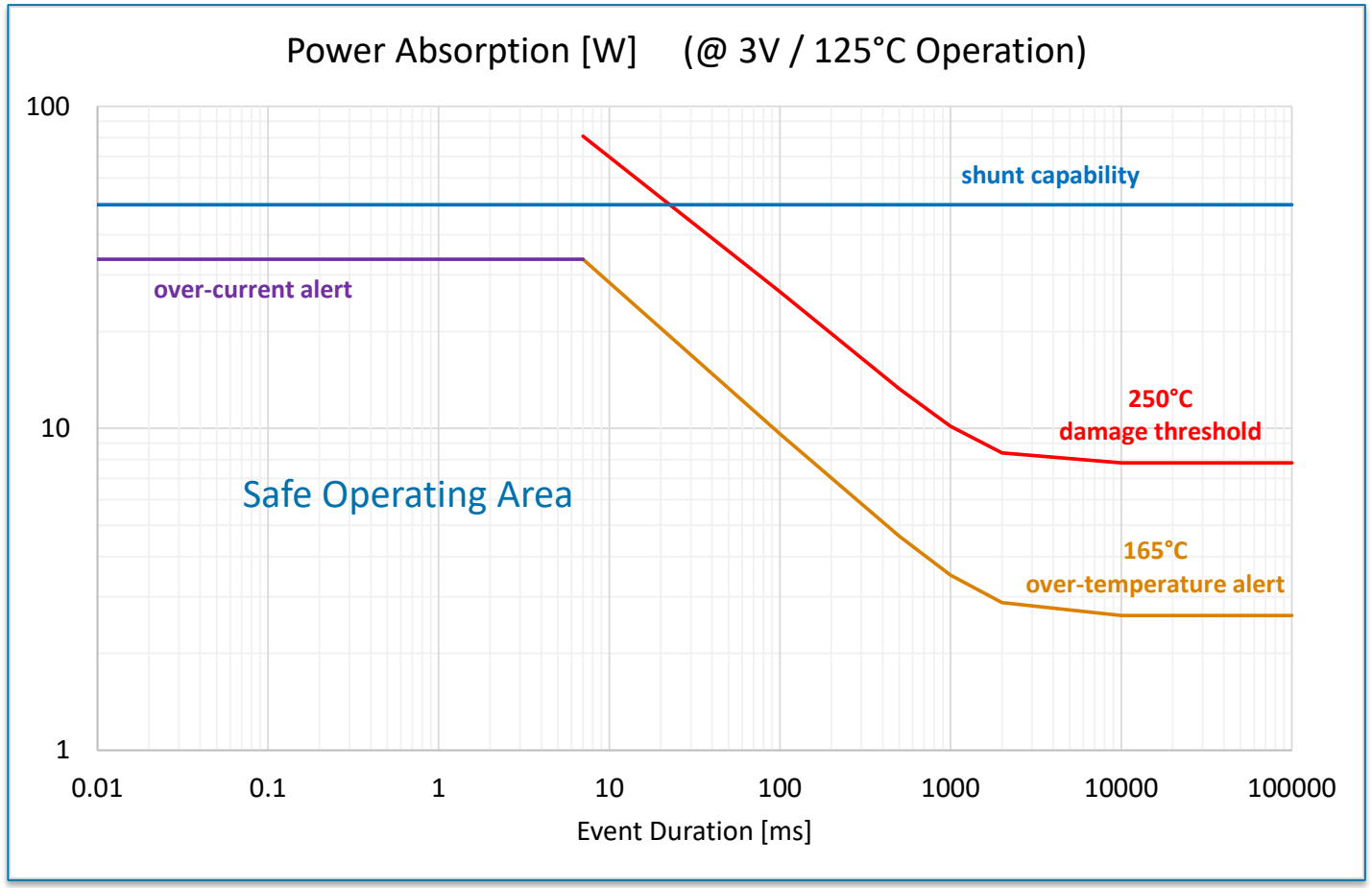
Dynamic Thermal Analysis

Thermal Characteristics:





Alert Functions and SOA:



Conclusion

Voltage Clamp IC component is designed:

- Easy applicable and versatile
- Fast and precise clamping and regulation
- Careful thermal design
- Radiation-hardened
- Test results will follow

Acknowledgement

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SPACE IC

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Thank you for your attention!

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