PCB Embedded Integrated Power Package: with thermally conducting prepreg (2017)

Project

Research on PCB Embedding and capabilities in System Integration as comparison to a PM in competitor technology
Funding: internal R&D

PCB Embedded SiC power module

- dies are sintered onto copper foil
- die top side contact: micro via
- safety isolation by the organic laminate
- isolated gate driver, 2 boosters on the PM
- Damped primary DC link on the PM
- current sensor and NTC on the top of the PM
- 8x M3 screws for low inductance connection to film DC link cap on system PCB

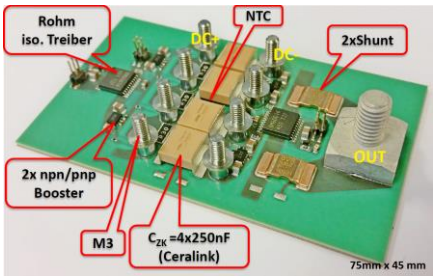
Performed tasks (by me)

- project management
- concept worked-out based on the customer requirements
- manufacturing flow design and alignment with customer and internal manufacturing team
- static thermal design for dies and RC snubber (Solidworks/LT Spice)
- electro-magnetic design of the power module (Altium/Solidworks, Fast Henry)
- Mechanical integration design
- Static electrical tests (Keysight B1505A)
- EM parasitics extraction of the power module by simulation and measurement
- Design of the demonstrator (inkl. DC link and gate driver)
- Dynamic electrical tests (DPT)

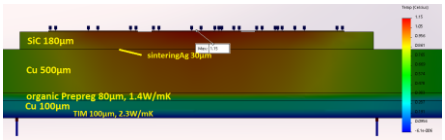
PCB embedded power module



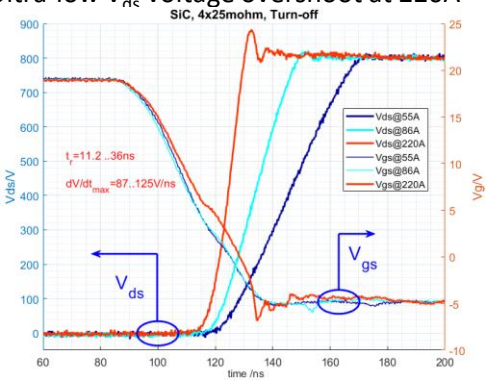
Integrated features



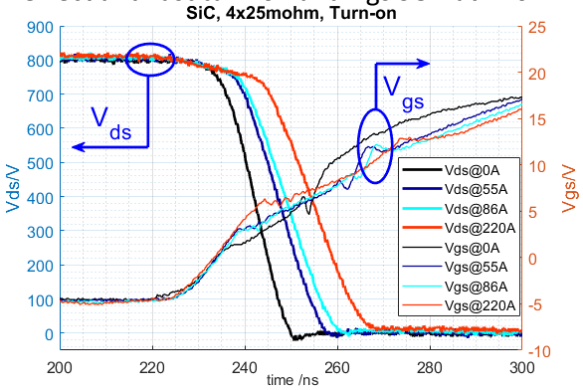
Thermal structure of the PM



Ultra-low V_{ds} voltage overshoot at 220A



Perfect and fast turn-on and Vgs SOA at 220A



[IEEE] K.Klein, E. Hoene, K. D. Lang, "Power module design for utilizing of WBG switching performance", in PCIM Europe 2019; International Exhibition and Conference for Power Electronics, Intelligent Motion, Renewable Energy and Energy Management, May 2019