ENERGY-EFFICIENT GRID-CONNECTED BATTERY CONDITIONER

Presentation of Green PE Pilot Results – January 2019

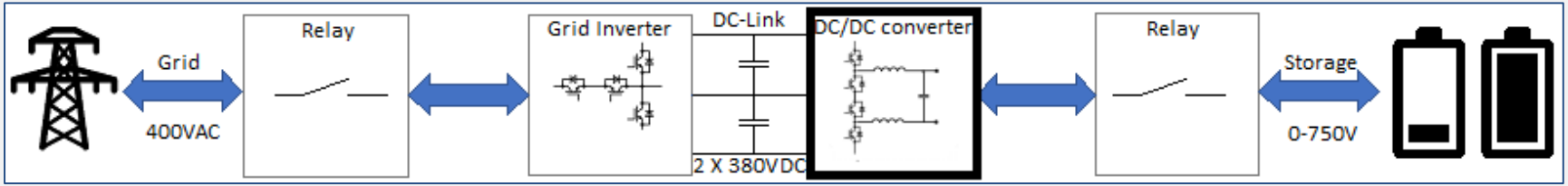
PASSION FOR
POWER ELECTRONICS

CONVERDAN
ENGINEERING

Design and manufacturing of
customized power electronics

E-MOBILITY PILOT DEMONSTRATOR

Grid-connected Battery Conditioner



- Charge and discharge of high voltage Li-Ion or LiFePO batteries with a minimum of energy loss.
- Enables energy efficient conditioning of the batteries during daily charging, battery stack manufacturing and potentially for grid support in a smart grid installation.

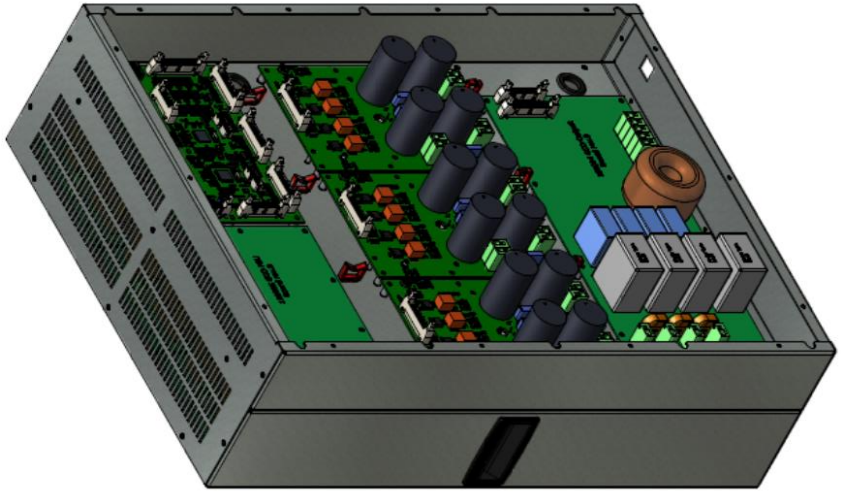
TECHNICAL OVERVIEW

Grid

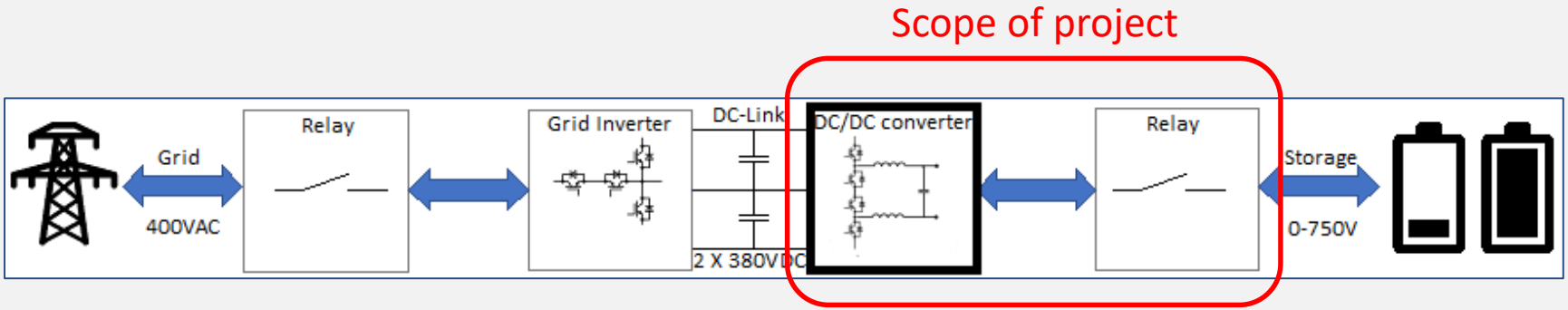
Nominal power (charge/discharge):	7.5 kW
Maximum grid current:	13 Arms
Grid connection type:	L1, L2, L3 + PE
Grid voltage range (including tolerances):	3 x 360 – 460 Vac
Grid frequency:	47 – 65 Hz

Battery Interface

Suited for series connection of:	192 cells up to app. 100 Ah rating
Protection and disconnect:	DC fuse in battery +, inrush limitation
Cut-off Voltage:	2.8 V/cell
Maximum Charging Voltage:	3.6 V/cell
DC voltage charge/discharge (full power):	537 V – 691 V



PROJECT FOCUS

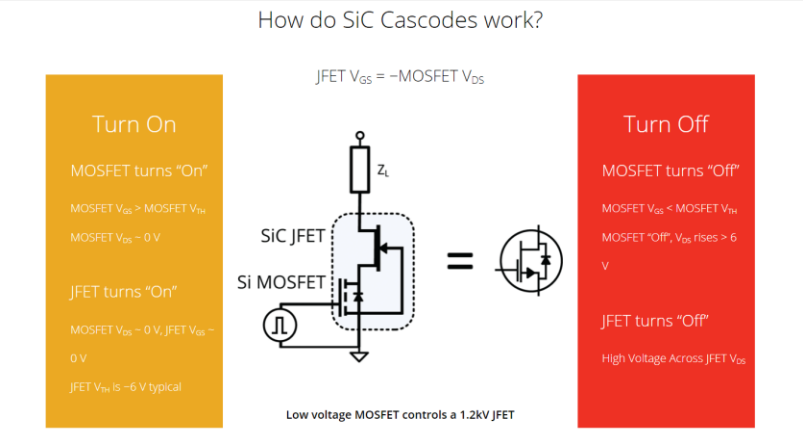


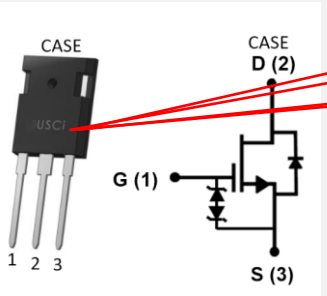
Design and prototyping of:

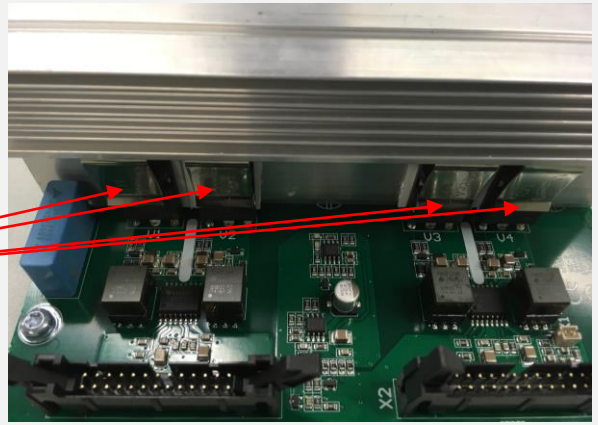
- Bi-directional DC/DC converter based on SiC MOSFETS
- Inrush control for connecting to storage bank

SiC CASCODES

Devices from: United Silicon Carbide (https://unitedsic.com/cascodes/)

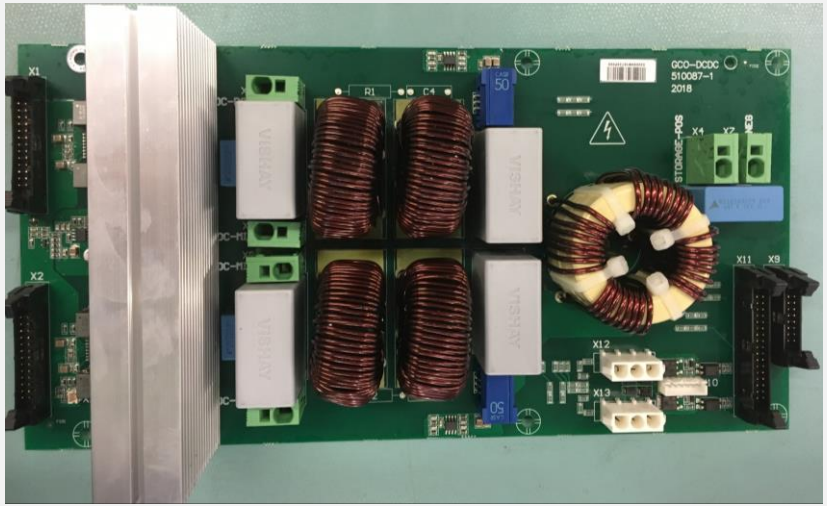




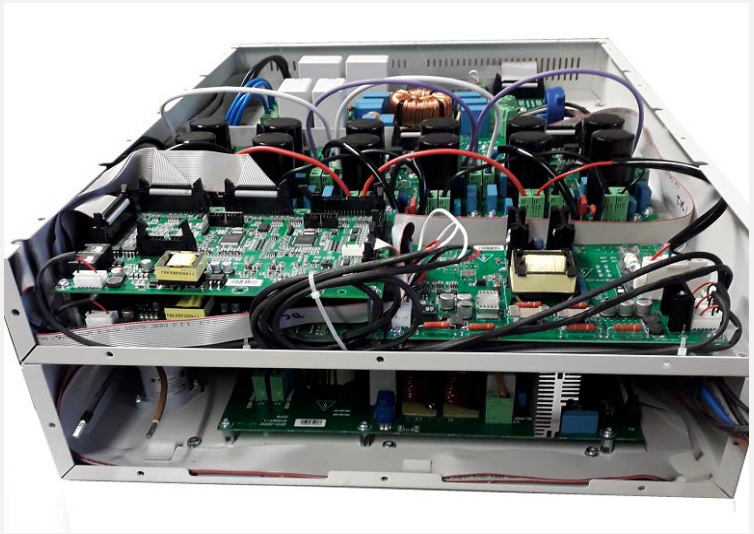


PROTOTYPE

DC/DC Converter Board

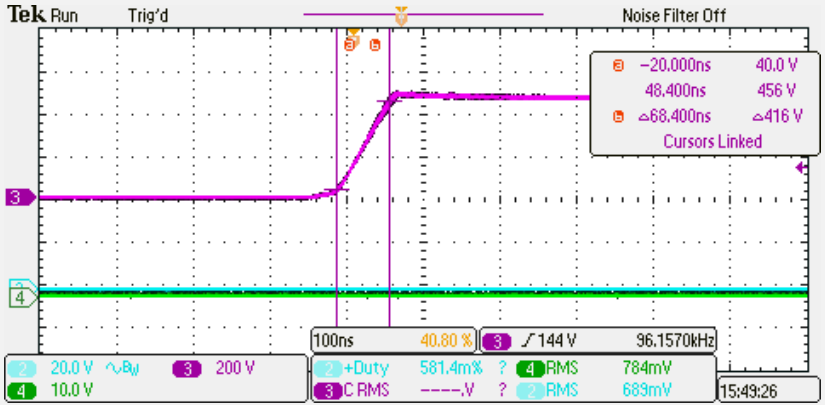


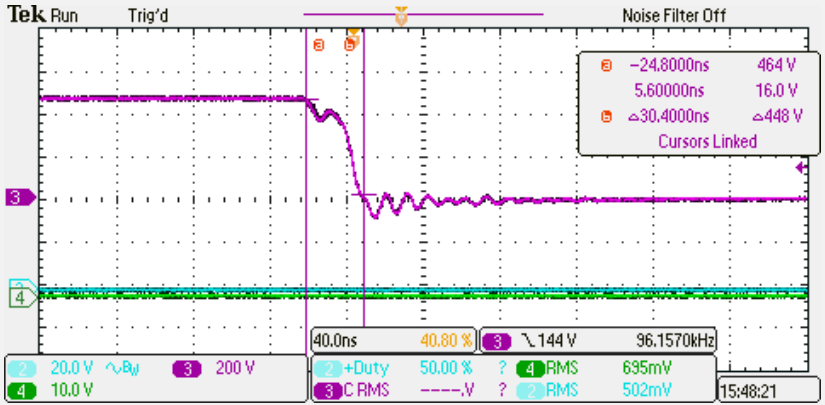
Complete Unit



SWITCHING PERFORMANCE

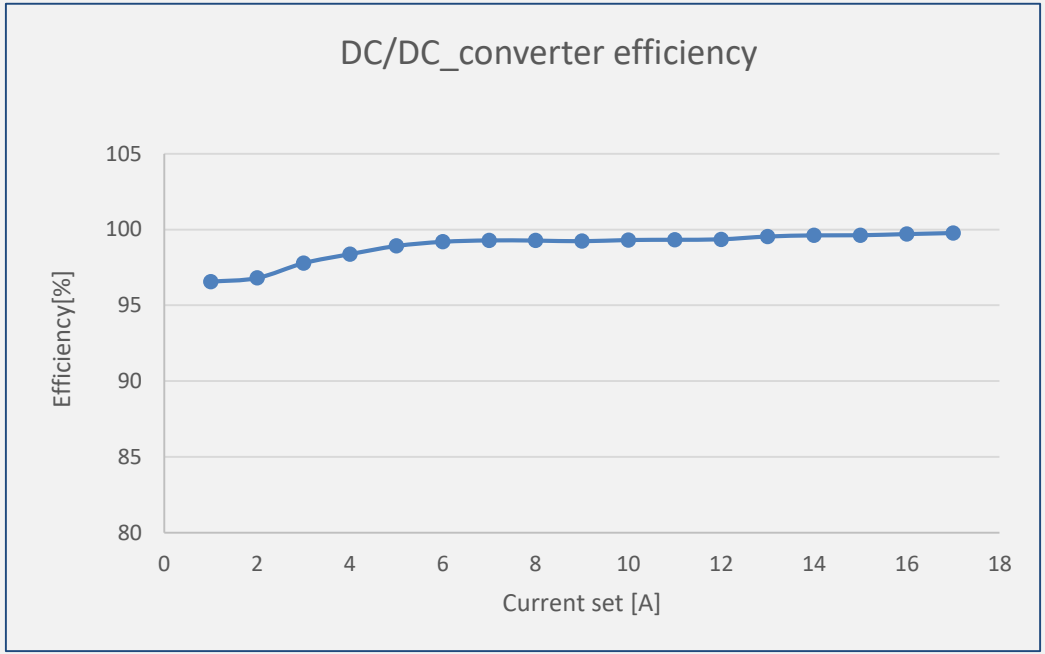
Very fast switching allows high efficiency





Low to moderate tendency for ringing/oscillations

EFFICIENCY MEASUREMENTS



FINDINGS & CONCLUSION

- SiC devices have both low switching losses and low conduction losses
- SiC devices primarily available in industry standard TO247 package
    - Power modules with SiC chips are coming, but the selection is still very limited
- Measuring equipment:
    - Very CMRR voltage probes required
    - Accuracy in measuring efficiency is difficult, due to very low losses

Questions ?