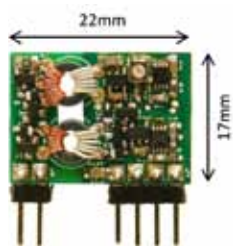


The Bristol Power Electronics Innovation Centre is an interdisciplinary forum for power electronics activities at the University of Bristol. It combines two main entities, the Electrical Energy Management Group and the Centre for Device Thermography and Reliability to form an interdisciplinary team of 8 Academics and 40 Researchers dedicated to power electronic systems. This research is funded from international government agencies and industry with a portfolio that includes EC JTI Clean Sky projects and the UK EPSRC Centre for Underpinning Power Electronics.

Bristol has strong expertise in exploring new developments in power semiconductors, including wide band-gap devices, and, working alongside our industrial partners, in exploiting advancements in power electronics in providing new capabilities and products.



Energy efficiency resonant gate driver module, with recovery of stored gate energy

**Electrical Energy Management Group** undertakes research into low carbon electrical systems that are enabled by advanced, compact and highly efficient electrical machines, and power electronic

conversion. The management of electrical power is the core challenge, with a focus on the systems employed in aircraft, automotive drive systems, renewable energy plant and micro-grids. Applications range from  $\mu\text{W}$  miniature energy scavenging to 200kW hybrid-electric vehicle power-trains.

- Supporting technologies for GaN and SiC power devices: novel gate drivers, switching-aid circuits, new circuit topologies, control methods, sensors...
- High-performance passive component design: multi-physics design optimisation, thermal and loss analyses, new mixed-material structures, novel integrated magnetic components
- Power electronic systems for the managing of energy at sub Watt levels for use in energy harvesting and HV supplies; novel circuit topologies, exploitation of non-linear behaviour
- Coupled electromagnetic/thermal/electrical system modelling, multi-objective optimisation, accurate reduced order/functional modelling of power electronic system elements
- Robust minimal sensor control methods, design for fault tolerance

**Centre for Device Thermography and Reliability** performs international leading research in power device thermal management and reliability including the development of new testing methodologies. The group's expertise is used to support development of new device con-



99% efficient three-phase inverter using super-junction devices.

cepts, in collaboration with key industrial partners in the UK, Europe, USA and Asia

- Novel materials, such as GaN, SiC, diamond, GaN-on-Si, GaN-on-diamond for electronics, including integration such as GaN-diamond (power and RF electronics) on device/chip level
- Development of new thermal, optical and electrical reliability testing methodologies (Raman thermography, transient trap analysis, electroluminescence, and various others)
- High power electronics packaging solutions (silver-diamond composites, metal multi-composite laminates)
- Device simulation (electronic, thermal and stress)



Advanced electrical, thermal and optical testing of GaN, SiC, Diamond power devices