Innovate UK

Results of Competition: Accelerating the commercial application of compound semiconductors under £100k

Competition Code: 1607_MM_SEMICON_SC

Total available funding is £4m across 2 streams

Note: These proposals have succeeded in the assessment stage of this competition. All are subject to grant offer and conditions being met.

Participant organisation names	Project title	Proposed project costs	Proposed project grant
e2v technologies (UK) Ltd University of Nottingham	Superlattice Electron Device (SLED) Frequency Multiplier for mm-Wave Applications	£71,019 £28,792	£35,510 £28,792
Project description - provided by applicants			
The aim of this project is to integrate the knowledge developed in the School of Physics, University of Nottingham, on artificial multilayer compound semiconductor crystals into commercially available superlattice electron device (SLED)-based, mm-wave frequency multipliers. SLED-based frequency multipliers offer e2v key technical and commercial advantages for multi-frequency imaging and open the market to supply ITAR-free, complete mm-wave sub-assemblies (including frequency sources and mixers) to our existing customer base in the security imaging and non-destructive testing markets.			

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Anvil Semiconductors Ltd	Increasing the thickness and quality of 3C-SiC grown on Si wafers to enable 1200V devices	£99,442	£69,609
Project description - provided by applicants			
Anvil's unique patented 3C-SiC/Si material and devices will shrink power converters in size, weight and cost, whilst significantly increasing efficiency. Conventional SiC devices (4H-SiC) enable many of these improvements but the cost is too prohibitive for many applications. Anvil is currently developing 650V 3C-SiC MOSFETs and diodes using the 3C-SiC material already developed, but 1200V devices require thicker SiC layers (12µm instead of 8µm) and as wafer bow levels scale with growth thickness, it requires additional stress relief techniques to enable fabrication of the 1200V devices required for many applications within the $billion market for PV inverters, electric vehicles, UPS's and industrial motors. The stress relief is achieved by carefully tuning the growth parameters and starting substrate. This multi-variable growth process has been optimised using experimentation and numerical modelling and has resulted in low bow, high crystal quality wafers for 650V devices. Extending this to 1200V is not just a case of extending the final growth phase but needs a re-optimisation of the whole growth process with significant experimentation with variables, extrapolation of the models, and characterisation of the grown material using electron microscope and X-ray diffraction.			

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Filtronic Broadband Limited	Feasabillity of Packaging Techniques For Future High Power GaN Microwave Devices	£94,124	£56,474
Project description - provided by applicants			
Our target is to develop a die attach method and package construction which will enable Filtronic Broadband to assemble Gallium Nitride (GaN) power semiconductor devices into low cost surface mountable packages, having the same level of reliability and performance as more expensive ceramic/glass based packages currently available on the market. This will result in a solution which is cost effective, easy to manufacture, and will enable GaN technology to be exploited in areas where it is currently not considered to be feasible.			

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Tribus-D Ltd	Embedded Electronic Packaging for Compound Semiconductor Power Applications	£58,622	£41,035
Ultrawise Innovation Ltd		£12,162	£8,513
University of Oxford		£24,282	£24,282
Project description - provided by applicants			
There is a growing need to generate, convert and distribute electric power from the source to the load, which is fulfilled through the use of power electronics. Packaging and assembly of the power electronics modules is important in determining the efficiency, size, weight and manufacturing costs. This project will seek to establish manufacturing methods to maximise thermal dissipation and minimise circuit parasitics through advanced interconnection and device embedding techniques and create a UK controlled supply chain for the manufacture of customised smart power modules.			

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Participant organisation names	Project title	Proposed project costs	Proposed project grant
Stratium Limited	Tunable compound semiconductor lasers for mid-infrared trace gas-sensing	£98,931	£69,251
Project description - provided by applicants			
Cascade Lasers, such as quantum cascade lasers (QCLs) are becoming increasingly important in many applications such as environmental monitoring and gas sensing. The advent of the 'Intenet of Things' and 'Industry 4.0' will drive both technical and cost challenges as manufacturers develop increasingly sophisiticated technology for a mass market. The global market for CL based sensing systems is predicted to increase from $148m in 2015 to ~ $1.7b by 2024 (optic.org 2015). This project aims to disrupt the global CL market by taking a completely new approach to the packaging of cascade lasers, simulatenously driving down costs and reducing manufacturing complexity whilst meeting the increasing spectral purity requirements of sensing system manufacturers. The project will result in the UK's supply chain for sensing devices becoming significantly more competitive on the world stage allowing it to capture a larger share of this high growth sector.			

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Microsemi Semiconductor Ltd	FOAM -Future Optical Amplifier Mounting	£70,765	£35,383
Project description - provided by applicants			
The FOAM (Future Optical Amplifier Mounting) project will make the possibility of higher data rates an economic possibility for small rural communities world wide. This is to be achieved by solving some of the fundamental problems associated with the construction of key components within the switching centres and make smaller faster switching centres a reality. At the same time this funding expands the Welsh capabilities in semiconductor packaging and innovation, securing current employment and opening the possibility of increased skilled employment in South Wales.			

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