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Delivery of OIKOS Platform Derivative for BMS

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Project	INCOBAT	**Project Number**	608988
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1 Publishable Executive Summary

The goal within INCOBAT[1] is to realize a 'close to production' BMS demonstrator platform to enable the various partners to perform research into BMS architectures and Electro-Impedance Spectroscopy. The benefit of using the latest automotive components in a research platform is that the time taken for the step from research to a production ready solution can be shortened, as techniques employed during research can be more directly applied. Added to this is the ever greater affordable computational power of modern multicore microcontrollers such as the new AURIX TC275T from Infineon. The integration of many BMS functions, with many different requirements into a single CCU is now possible as the parallel processing capabilities of the microcontroller mean that different project partners can supply their software into one common platform and run in an encapsulated processing environment, with freedom from interference' from and to other processes. The objective in INCOBAT is to provide the lowest cost system solution to a BMS by fully integrating all BMS functions into a single ECU.

The CCU is novel in many ways due to the high integration and high functional density. It also supports functional safety up to ASILD so supports even the highest degree of rigor required for mission critical processing. The design integrates the High Voltage (HV) monitoring circuits using an area of the PCB which is galvanically isolated from the rest, again saving cost, reducing component and overhead and increasing performance and reliability. There is also the need for digital signal generation and analogue voltage measurement in the HV domain, so standalone devices are integrated and galvanically isolated by digital interfaces over SPI.

The hardware is supplied in a metal housing, which is machined from aluminum. This allows a fully grounded base plate to be used around the undersides of the PCB as well as a removable lid for prototyping and research. An additional plastic cover is also included inside the top metal cover to protect engineers from accidental electric shock when working on the CCU or demonstrating it to others. The connectors and mating halves are sealed, so the completed case is watertight to IP55.

[1] INnovative COst efficient management system for next generation high voltage BATteries, www.incobat-project.eu

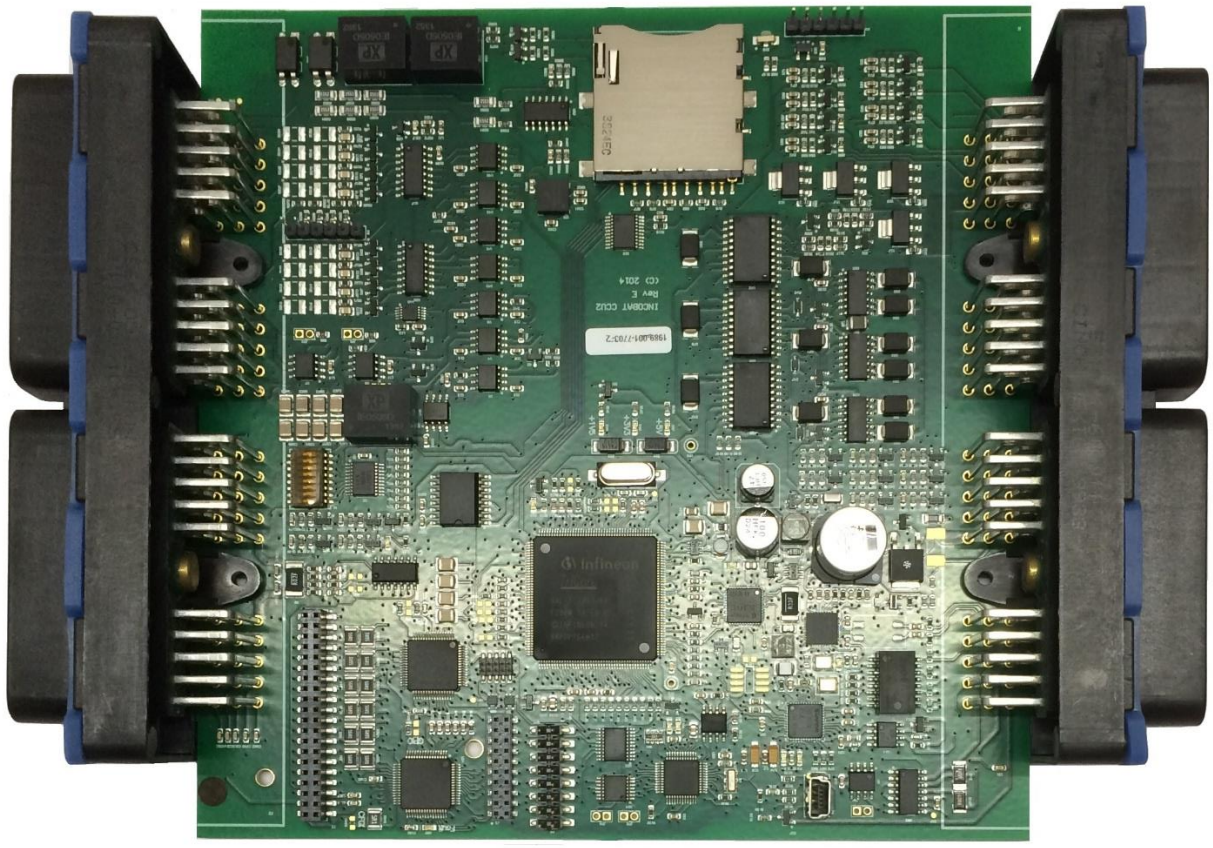

Figure 1: INCOBAT BMS CCU Prototype Hardware.

The INCOBAT BMS CCU is based on the Infineon multicore processor AURIX TC275. This device supports the concurrent execution of mixed ASIL functions up to ASIL-D. It offers a rich set of peripherals such as A/D converters for data capturing and it has a reasonable number of IOs to support BMS applications. In conjunction with the specific power supply ASIC TLE35584 it is possible to supply the CCU and support ISO26262 requirements with a minimum number of components.

There is a particular HV area, HV Interlock / ADC, on the lower right of the CCU picture shown in Figure 1. This connects to the HV battery and enables the integration of functions which are usually provided by a separate HV control board. Of course the CCU design considers HV requirements which apply particular to this area like insulation and creepage distances. For safety reasons there is a specific plastic cover for this area of the CCU (not shown in Figure 1).The ADC channels provided by this HV area are intended to be used for the novel and innovative EIS battery state estimation approach

Low and high side drives are available to control contactors for various components such as DC/DC charger. Several digital inputs and low voltage ADC inputs are available. Well known state of the art communication interfaces like CAN-FD, USB and 100BaseT Ethernet are available. For early technology

adoption and exploration a novel BroadR-Reach (BrdR) transceiver is provided. An SD card slot is available to record historical data and to support (software) development.

The Config/Buffers area provides a real time clock with periodic alarm and time of day measurement. An accelerometer is included here for crash detection. Finally the BMS System ICs provide a communication channel to Infineon's advanced Battery Monitoring and Balancing IC for automotive and industrial applications. At the edges of this area there are 2 connectors (the white vertical bars in Figure1). These connect to a daughterboard which provides specific functions for the EIS feature, mainly the generation of the stimulus signal. Of course this approach contradicts to the cost objective. The reason why this is not implemented on the main board is the increased flexibility to support changes of the hardware.