

Bochum, April 1th, 2016

## **Hannover Messe: Scienlab presents solutions for BMS development based on Linear Technology BMS products**

Scienlab will present its engineering services and products for the entire development chain of battery management systems (BMS) at Hannover Messe, Linear Technology Stand H23, Hall 9.

In addition to its energy storage test system for characterization of cells, Scienlab will also present a BMS test environment for BMS development and validation, as well as newly developed Module Monitoring Electronics using Linear Technology's LTC6804 multicell battery monitor.

The LTC6804 is a 3rd generation multicell battery stack monitor that measures up to 12 series-connected battery cells with a total measurement error of less than 1.2 mV. The cell measurement range of 0 V to 5 V makes the LTC6804 suitable for most battery chemistries. With six programmable 3rd order low pass filter settings, the LTC6804 data acquisition rate and noise reduction can be optimized for the application. In the fastest ADC mode, the LTC6804 can measure all 12 cells within 290  $\mu$ s.

The BMS development at Scienlab is based on the proven V-model, which comprises the phases of design, implementation and testing.

### **BMS design**

Alongside its own BMS, Scienlab also offers specific tailor-made solutions for customer applications. For this purpose, the company determines the necessary BMS functions taking into account the individual customer application, compliance with applicable standards and safety requirements. Specifications are then defined for development as well as the software and hardware.

### **Implementation of BMS software and hardware**

Scienlab offers complete model-based software development including code generation in MATLAB/Simulink. This simplifies ideal parameterization of the BMS for the cells used, and thus ensures optimum capacity utilization and maximum durability of the connected cells.

Since the purely statistical values from the battery datasheet are not sufficient for optimum BMS design, cells are characterized with Scienlab's energy storage test system in order to determine the required parameters. Non-linear effects are also included here, such as the interdependencies of temperature, current or state of charge.

For model-based development, Scienlab also has a model-based test environment. In this environment, the BMS software can be tested at very

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early stages of development with the aid of cell models and simulation of the other BMS peripheral devices (e.g., charger). Scienlab also realizes the corresponding BMS hardware for the specific customer application.

### **BMS validation with Scienlab test systems**

The BMS is validated with the Scienlab BMS test environment. Using various emulators that simulate the cells, current and temperature sensors and insulation resistances, reproducible, safe and reliable BMS tests are carried out without the need for real components such as battery cells.

Interfaces with real-time capability permit fast data transfer (1 kHz) between the test systems and the hardware-in-the-loop system. The voltage measuring accuracy of up to  $\pm 0.2$  mV and current measuring accuracy of up to  $\pm 2$   $\mu$ A ensure exact voltage and current adjustment and therefore optimum emulation of the cell characteristics. Highly dynamic bidirectional voltage sources permit voltage jumps in less than 80  $\mu$ s.

### **About Scienlab electronic systems GmbH**

Scienlab electronic systems GmbH in Bochum produces test systems to test industrial products as well as electrified drive train components for electric and hybrid vehicles. The business unit Test Systems develops customer-specific test environments for high-voltage energy storage systems, battery management systems, inverters, DC/DC converters, charging devices and charging infrastructures, and for the integration of multiple components. Scienlab's Common Rail unit offers testing solutions for all development and manufacturing processes relating to actuators and injectors.

As a development partner and engineering service provider Scienlab also offers customer-specific solutions, such as analog and digital measurement and circuitry systems as well as control devices in small series for various applications in automobiles and industry.

Scienlab relies on 15 years of experience gathered in numerous successful projects and engages in cooperations with reputable automobile manufacturers and suppliers.

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**About Linear Technology Corporation**

Linear Technology Corporation, a member of the S&P 500, has been designing, manufacturing and marketing a broad line of high performance analog integrated circuits for major companies worldwide for over three decades. The Company's products provide an essential bridge between our analog world and the digital electronics in communications, networking, industrial, automotive, computer, medical, instrumentation, consumer, and military and aerospace systems. Linear Technology produces power management, data conversion, signal conditioning, RF and interface ICs,  $\mu$ Module® subsystems, and wireless sensor network products. For more information, visit [www.linear.com](http://www.linear.com).

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