Linear Technology Demonstrates First Wireless Battery Management System in BMW i3 at Electronica Show

MILPITAS, CA – November 8, 2016 – Linear Technology, the leading provider of battery stack monitoring ICs for electric and hybrid/electric vehicles, is demonstrating the industry's first wireless automotive battery management system (BMS) concept car at the Electronica Show this week in Munich, Germany (Booth 524, Hall A4). This wireless BMS concept car, developed by Linear's design partner LION Smart, combines Linear's highly accurate battery stack monitors with its SmartMesh® wireless mesh networking products in a BMW i3, replacing the traditional wired connections between the battery packs and the battery management system. This demonstration of a fully wireless BMS car represents a significant breakthrough that offers the potential for improved reliability, lower cost and weight, and reduced wiring complexity for large multicell battery stacks for electric and hybrid/electric vehicles.

Automakers are challenged to ensure the driving public that electric and hybrid/electric vehicles are both safe and reliable. Linear's road-proven high voltage battery stack monitors deliver industry leading accuracy and reliability, enabling battery management systems that maximize battery pack performance and longevity. The LTC6811 is a complete battery measuring device for hybrid/electric vehicles that can measure up to 12 series-connected battery cell voltages with better than 0.04% accuracy. Combining the LTC6811 with Linear's SmartMesh wireless mesh networking system addresses the persistent reliability issues associated with automotive wiring harnesses and connectors.

Field-proven in industrial Internet of Things applications, SmartMesh embedded wireless networks deliver >99.999% reliable connectivity in harsh environments by employing path and frequency diversity. In addition to improving reliability by creating multiple points of redundant connectivity, the wireless mesh network enables additional BMS capability. Wireless connectivity enables more flexible placement of battery modules, and makes possible the installation of sensors in locations previously unsuitable for a wiring harness. Wireless sensors

integrated into the SmartMesh network, such as current and temperature monitors, offer the potential for synchronizing these measurements with cell voltages.

Erik Soule, Vice President, Signal Conditioning Products for Linear Technology, stated, "Linear's innovations in two critical industry leading technologies enables wireless battery management at automotive reliability levels. New designs of electric and hybrid/electric vehicles are increasing rapidly and all of the major automotive manufacturers are searching for ways to improve the performance and reliability of their battery management systems as they move into higher volume production. The wireless BMS concept car, realized through the expertise of LION Smart's BMS design, showcases our product vision."

Mr. Daniel Quinger, CEO of LION Smart, stated, "One of our goals in this ambitious project is to demonstrate the improvement in range and charging time that can be achieved by using the latest technologies in partnership with leading global players. Combining Kreisel Electric's laser welded 18650 modules with direct liquid cooling and Linear Technology's SmartMesh IP wireless mesh and the LTC6811 battery monitoring IC, together with LION Smart's Open BMS, enabled a unique battery system with record breaking charge time of just 15 minutes, an energy capacity of over 55kWh, with a range of over 400km. This represents a truly remarkable accomplishment."

The wireless BMS concept car, featuring the BMW i3, shows the promise of wireless technology to significantly improve reliability and simplify the design of automotive battery management systems.

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About Linear Technology

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, μModule® subsystems, and wireless sensor network products. For more information, visit www.linear.com

LION Smart GmbH

LION Smart is an innovative engineering service company for original equipment manufacturers (OEMs) and suppliers of the automotive industry as well as for other industries. LION Smart GmbH has positioned itself as a key partner for the industry in energy storage and battery management, particularly in the field of electric mobility. As a high-class service provider, LION

Smart also offers consultancy services, battery workshops and seminars in this field. The company operates test facilities and test laboratories for electric storage devices with the TÜV SÜD AG (TÜV SÜD Battery Testing GmbH). The company also closely collaborates with universities and research institutes in the course of designing, testing and building battery packs, as well as for hardware and software development of high performance battery management systems (BMS) for lithium-ion storage technology.

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