

# Mornsun Converter Solutions for Intelligent Power Management in HEV/EV Applications

*When the average consumer thinks of intelligent transportation, they might envision self-driving vehicles dodging obstacles and choosing efficient traffic routes. While that certainly is part of intelligent transportation, there are other critical systems and modules involved that are just as vital but far less recognized. One of the most important systems within automotive applications involves intelligent power management found in HEV (hybrid electric vehicles) and EV (electric vehicles). According to [Bloomberg](#), 57% of all passenger vehicle sales will be electric by 2040 -- making the development and implementation of efficient, compact, reliable power management systems extremely important. In short, power supply solutions are critical for the future of the HEV/EV industry.*

## Intelligent Power Management

An effective battery management system (BMS) in any HEV/EV application involves circuits that are responsible for monitoring both the charging and discharging of batteries, as well as communication with other vehicular systems. In addition to supplying power to HEV/EV systems, other responsibilities of a BMS are:

- Monitoring the state of the battery  
(e.g., state of function, state of charge, state of capacity)
- Keeping the battery from trying to operate outside of its safety envelope
- Calculating secondary data related to the monitoring and control of the battery
- Communicating both primary and secondary battery data with other systems
- Providing control of the battery based on primary and secondary data
- Balancing the battery system  
(e.g., keeping the voltages levels the same or preventing batteries from overcharging)

Simply put, the BMS ensures the reliability, longevity, and protection of the battery supply for HEV/EV. In terms of intelligent transportation, the BMS performs a vital function — if it fails, not only is the vehicle in danger, but so are its passengers and those nearby.

The power supply for an HEV/EV vehicle is heavily dependent on the intelligent charging device which must integrate seamlessly with the BMS. In addition, the power supply

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must provide current to systems that are safety-critical, such as the electronic accelerator, tire pressure detecting system, control and driving system, and the CAN communication system. Operation of the car itself is heavily dependent on the ECS (engine control system), ignition system, motor voltage monitoring system, and the car meter panel.

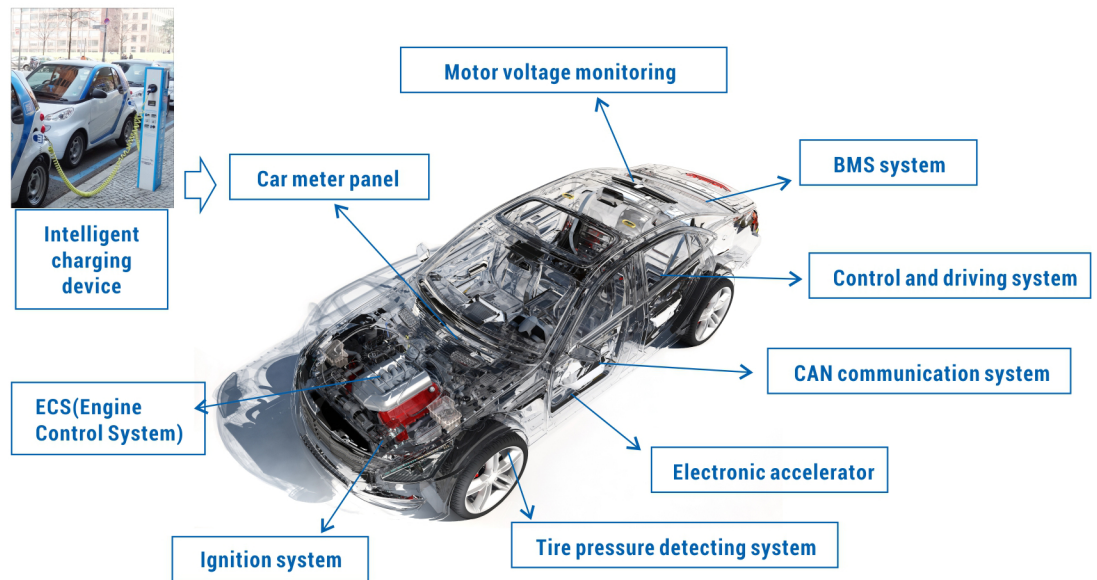


Figure 1.  
Key modules in an  
HEV/EV vehicle

## Critical Design Aspects for Intelligent Transportation Modules

When designing the circuitry for the various systems involved in the power supply and intelligent BMS for an HEV/EV, engineering considerations include:

- An operating temperature range in accordance with automotive applications
- Compatibility with standard current and voltage requirements
- High isolation voltage
- Protections against potential problems such as short circuits
- Reliability
- High efficiency

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- AEC-Q100 approved
- IATF16949 compliant

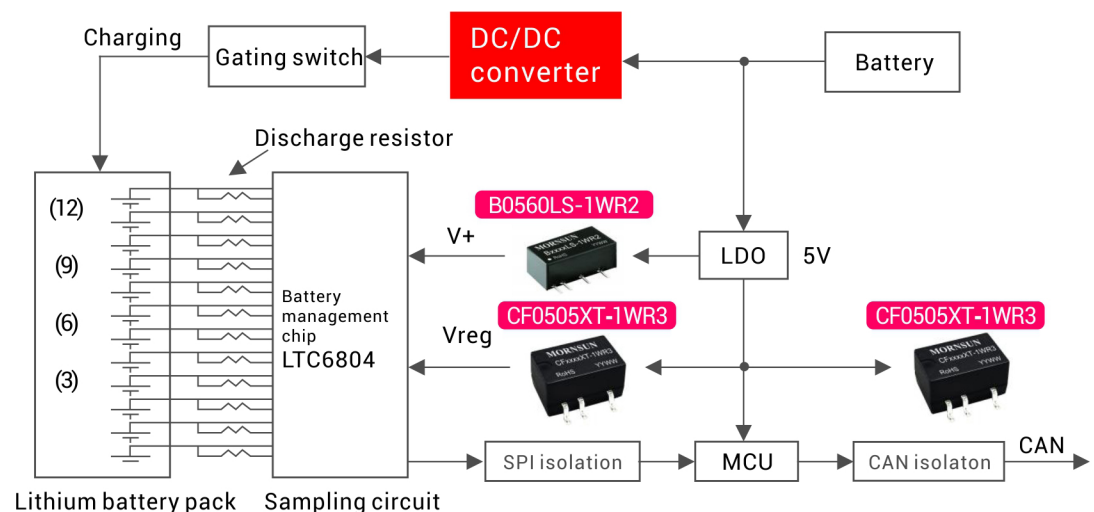
In addition, engineers are typically looking for compact designs that are compatible with standard pin-outs.

### DC-DC Converters

DC-DC converters are among the many circuitry components involved in a standard BMS for an EV/HEV. Mornsun offers a series of DC-DC converters that are ideal for intelligent automotive applications, including those involving the BMS.

Mornsun's line of AEC-Q100 approved DC-DC converters has an operating temperature range on the order of  $-40^{\circ}\text{C}$  to  $105^{\circ}\text{C}$  and is designed to withstand the harsh conditions of automotive applications. The DC-DC converter [CF0505XT-1WR3](#) modules shown in the block diagram below are fully IATF16949 compliant and provide continuous self-recovery short-circuit protection. They have a 3500VDC isolation voltage and operate at an average efficiency of 82%. These DC-DC converters are compact with an internal SMD design and an international standard pin-out.

Figure 2.  
Block diagram of a BMS



Other automotive applications for these converters include motor vehicle communication system controllers, engine control systems, ignition systems, motor voltage monitoring, and automobile tire pressure detection system – all critical aspects of intelligent transportation involving EV/HEV.

## **Mornsun Provides Intelligent Transportation Solutions**

As the shift to new energy continues and the need for intelligent transportation in the automotive industry grows, Mornsun is regularly looking for ways to upgrade their designs, providing you with up-to-date converter solutions. Mornsun's comprehensive power solutions for automotive applications are reliable and compliant with key international industry standards to ensure you have the proper converters for your BMS. Included in our line of products are AC-DC converters (including some models specifically for charging points), DC-DC converters, and industrial buses all well-adapted for use in intelligent transportation, including HEV/EV.