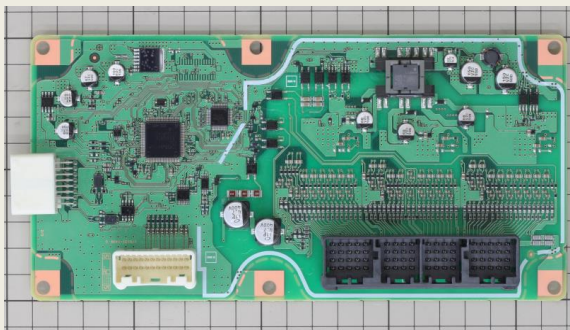
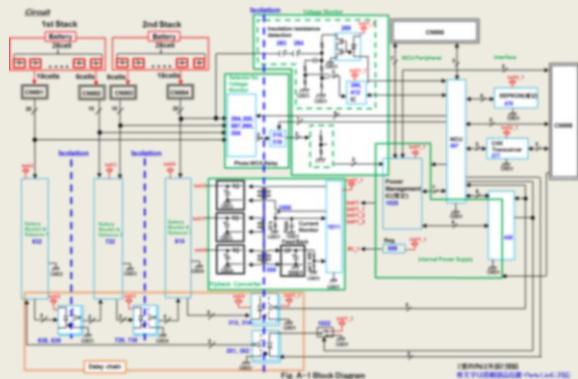


TOYOTA PRIUS ZVW51 BATTERY MONITOR SYSTEM (BMS) CIRCUIT ANALYSIS REPORT

June, 2016. This sixty-two page document is one of six reports, each analyzing various segments of the ZVW51 system. This report is focusing on the PCB and its detailed circuits analysis. PCB structural details with various dimensions, component list, block diagram, detailed circuit schematic diagram, and transformer inductance measurement results are included.



BMS (Top View)



Block Diagram

This BMS PCB has monitor and cell balancing functions for 56 cell Li-ion batteries (28 cells, 2 stacks). Three ASICs, developed by DENSO, are mounted on the printed circuit board. The system has the following main features:

1. BMS functions performed by a single PCB for all 56 Li-ion battery cells.
2. Single ASIC monitors up to 20 cells.
3. Three battery monitor systems are implemented in this printed circuit board: ASIC1 monitors 19 cells, ASIC2 monitors 18, and ASIC3 monitors 19 cells, a total of 56 cells.
3. No external transistors found for cell balancing.
4. There are two channels for daisy chain communication.

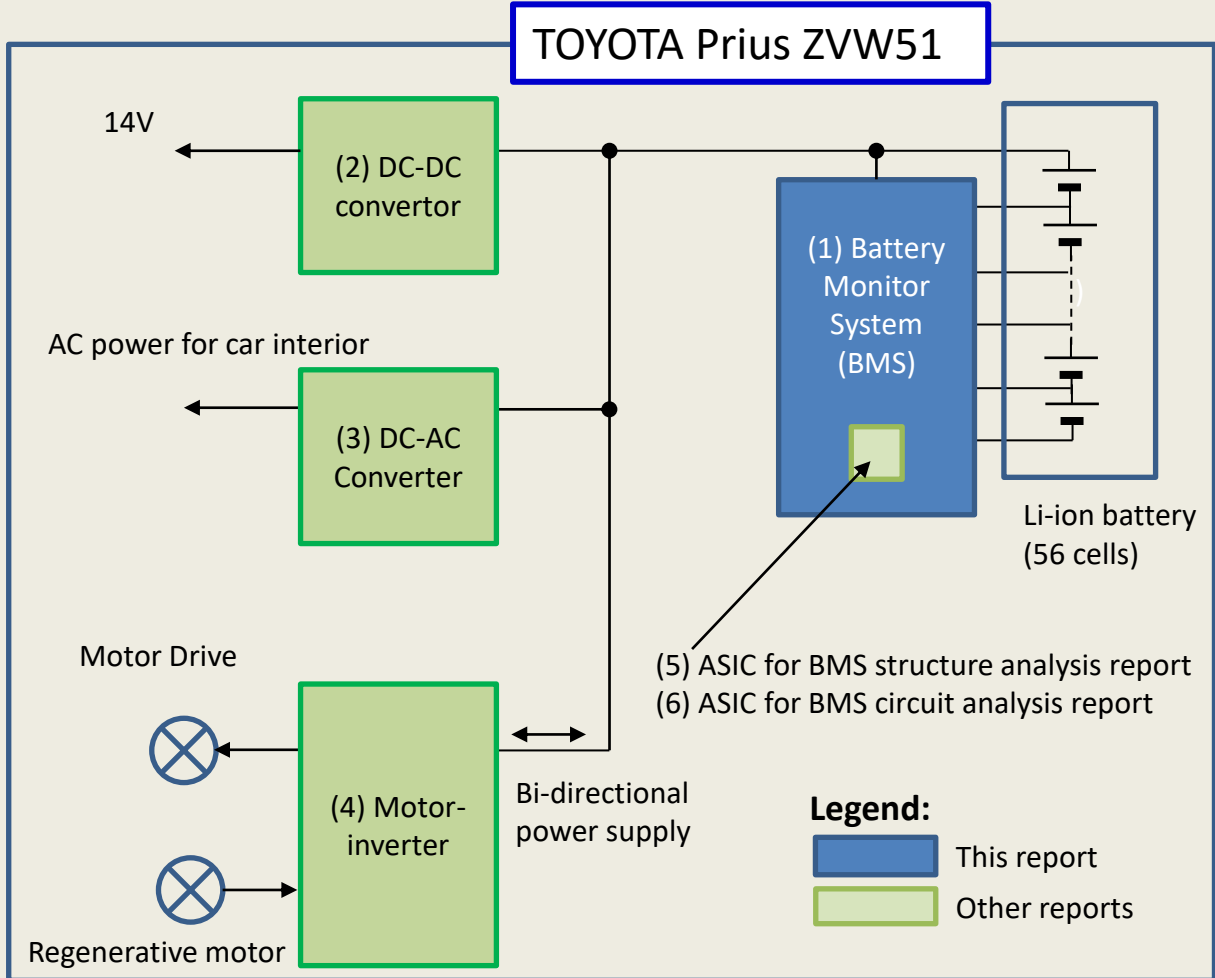
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15G-0006-1

The block diagram of the Toyota Prius ZVW51 system, and the corresponding LTEC analysis reports are listed below:



Family of LTEC analysis reports related to the ZVW51 System

Report No.

1. BMS PCB circuit analysis report (this report)	15G-0006-1
2. DC-DC converter PCB circuit analysis report	15G-0007-1
3. DC-AC converter PCB circuit analysis report	16G-0001-1
4. Motor-inverter PCB circuit analysis report	15G-0008-1
5. ASIC for BMS structure analysis report	15G-0013-1
5. ASIC for BMS circuit analysis report	15G-0005-1

15G-0006-1

Examination of the control board, the subject of this report, leads to our conclusion that the use of ASICs on this PCB represents a well thought-out design that leads to significant size reduction and cost savings. The absence of cell-balancing discrete components in the PCB is also noteworthy.

In reference to Page 2, all six constituent elements of the ZVW51 system, analyzed and reported on by LTEC, reflect that overall, the Toyota Prius ZVW51 system is an exceptionally well thought-out compact, highly cost-effective design.

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