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# Automotive Buck-Boost Chipset Meets Demands Of Start-Stop Vehicle Systems

ROHM's buck-boost power supply chipset is said to provide the lowest current consumption in the industry along with stable performance (transient response characteristics) in automotive ECUs (electronic control units) for cluster panels and gateways used in start-stop vehicle systems. The chipset integrates the BD8P250MUF-C, a buck converter with boost functionality, and the BD90302NUF-C, a dedicated boost IC (Fig. 1.)

The primary chip (BD8P250MUF-C) uses ROHM's novel buck-boost control technology, dubbed Quick Buck Booster, which enables configuration of a buck-boost power supply without degrading buck power supply characteristics by simply adding the dedicated BD90302NUF-C boost IC to the subsequent stage. According to the company, the result is an industry-best no-load current consumption of 8 µA and ±100-mV output voltage fluctuation using an output capacitance 44 µF (this equates to 70% less current consumption and 50% less output capacitance vs conventional products, says the vendor). This performance contributes to improved stability and energy savings in applications where significant input voltage drops occur in a short period of time, such as start-stop vehicle systems (see Fig. 2).

In addition, the Quick Buck Booster technology allows for a common board design that integrates both buck-boost and buck power supply topologies along with the requisite peripheral components and noise countermeasures. According to Rohm, this approach reduces development time and labor by 50% compared to conventional methods requiring separate buck-boost and buck power supply boards (Fig. 3.)

In vehicles with start-stop functionality, which turns a vehicle's engine/motor off while idling, a buck-boost power supply is required to prevent malfunctions due to low battery voltage during idling and battery fluctuations (cranking) immediately after start-stop operation. However, conventional products are problematic from the standpoint of current consumption and responsiveness, increasing the demand for an improved solution as the number of stop-start vehicles continues to rise.

In response, ROHM has leveraged analog design technology and power system processes to develop innovative solutions for the automotive market, such as this buck-boost power supply chipset. ROHM's buck-boost control technology allows users to easily switch to buck-boost operation without sacrificing the performance advantage buck converters provide over buck-boost power supplies.

Implementing a buck-boost topology while maintaining the same characteristics as buck power supplies reduces the size of peripheral components along with development load, contributing to system optimization and stable operation in applications where sudden voltage drops occur, such as ECUs used in start-stop vehicle systems. Table 1 compares the performance this new chipset with a competing buck-boost converter solution and also highlights the buck-like performance achieved by the chipset.

To meet market demands, the BD8P250MUF-C integrates a spread spectrum function as a countermeasure against electromagnetic interference (EMI), allowing it to clear the international standard (CISPR 25) for noise in the automotive sector. At the same time, ROHM's original Nano Pulse Control enables high speed operation at 2.2 MHz, which moves switching noise above the AM radio band (1.84 MHz max.), making it possible to achieve stable 5-V output for ECU drive from high-voltage 36-V input.

The chipset offers the buck-boost converter in two models, while the buck is offered as a single model. See Table 2 for key electrical specs. These chips are available now in sample quantities and will be available in OEM quantities in January. For more information, see the BD8P250MUF-C page and the BD90302NUF-C page.

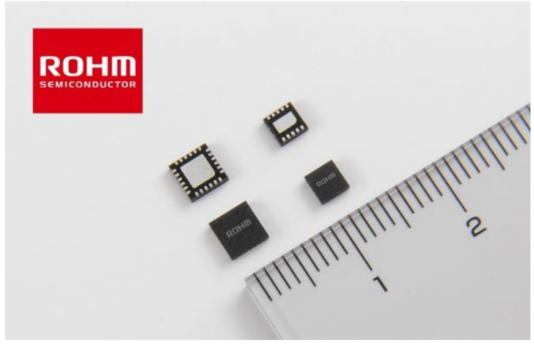
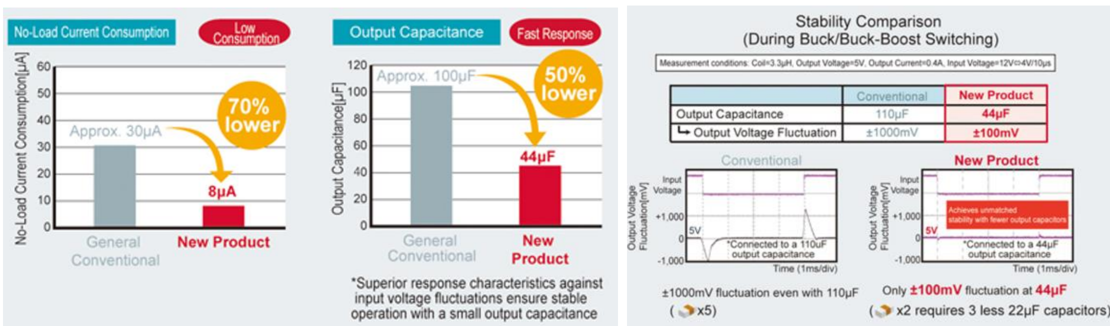



*Fig. 1. The buck-boost power supply chipset integrates a buck dc-dc converter with boost functionality (BD8P250MUF-C) and a dedicated boost IC (BD90302NUF-C). It is designed for use in automotive ECUs for cluster panels and gateways used in start-stop vehicle systems.*




(a) (b)

*Fig. 2. When compared with conventional buck-book power supplies, Rohm's BD8P250MUF-C + BD90302NUF-C chipset is said to achieve the industry's lowest current consumption and fastest response (a). The chipset maintains a stable output voltage during buck-boost switching with just 44 μF of output capacitance (b).*

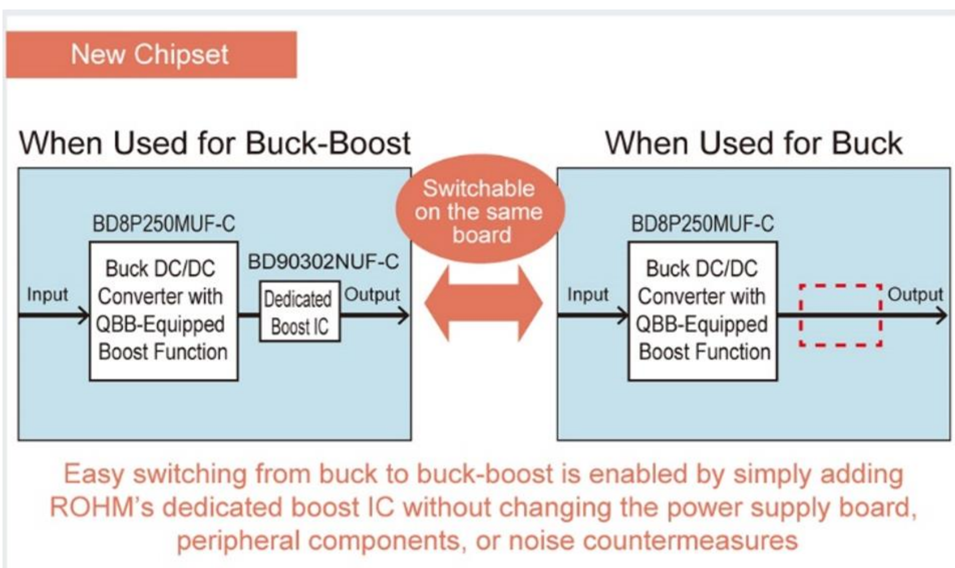



*Fig. 3. ROHM's chipset with Quick Buck Booster technology makes it possible to provide a common design that combines both buck and buck-boost power supply operation on a single board along with the requisite peripheral components and noise countermeasures. This makes it easy to switch from buck to buck-boost operation by simply adding a dedicated boost IC, reducing design load by as much as 50% compared with conventional methods using separate power supply boards.*

Table 1. Comparing the performance of the BD8P250MUF-C + BD90302NUF-C chipset with a competing buck-boost converter.

| | Buck DC/DC Converter BD8P250MUF-C | | Buck-Boost Chipset BD8P250MUF-C +BD90302NUF-C | General Conventional Buck-Boost DC/DC Converter |
|---|---|---|---|---|
| No-Load Current Consumption | 8μA | Low Consumption | 8μA Industry-Leading Performance | Approx. 30μA |
| Shutdown Current | 3μA | | 3μA | Equivalent |
| Min. Input Voltage | 3.5V | | 2.7V | Equivalent |
| Operating Switching Frequency | 2.2MHz | High Frequency Operation | 2.2MHz | Equivalent |
| Efficiency | 88% | High efficiency | 87% | 85% |
| Max. Output Current | 2A | | 0.8A | Equivalent |
| Output Capacitance | 44μF | Fast Response | 44μF | Over 88μF |
| External Parts | 5 | Few Parts | 5pcs | Over 5pcs |
| Spread Spectrum Function | Included | Low Noise | Included Industry-Leading Performance | none |

Table 2. Key electrical specifications for Rohm's new automotive buck-boost chipset.

| Topology | Part No. | Input Voltage Range | Output Voltage | No-Load Current Consumption | Output Voltage Accuracy | Operating Frequency | Max. Output Current | Operating Temperature Range |
|---|---|---|---|---|---|---|---|---|
| Buck-Boost | BD8P250MUF-C<br>BD90302NUF-C | 2.7V to 36V | 5V | 8μA (typ.) | ±2% | 2.2MHz | 0.8A | -40°C to 125°C |
| Buck | BD8P250MUF-C | 3.5V to 36V | 5V | 8μA (typ.) | ±2% | 2.2MHz | 2.0A | -40°C to 125°C |