

New Automotive Primary DC/DC Converters Offer Stable Output Even with Fluctuating Input Voltage

Nov 6th, 2020

Fast response and high efficiency contribute to lower power consumption

ROHM has developed a new lineup of twelve automotive primary DC/DC converters. The BD9P series are optimized for ADAS (Advanced Driver Assistance System) sensors, cameras, and radars, along with car infotainment and instrument clusters.

In recent years, the continued electrification of vehicle systems has increased. Combined with the limited amount of power available, this trend emphasizes the need for lower power consumption. At the same time, the output voltage from the batteries and generators can vary widely, demanding a versatile power supply solution.

The need for fast response to provide stable operation and higher power conversion efficiency are crucial, which have been difficult to meet with conventional power supply ICs. The new product adopting original advanced power supply technology, Nano Pulse Control™, enables high speed operation at 2.2MHz that will not interfere with the AM radio band (1.84MHz max.) while achieving high step-down ratio. It is an optimum technology for automotive applications.

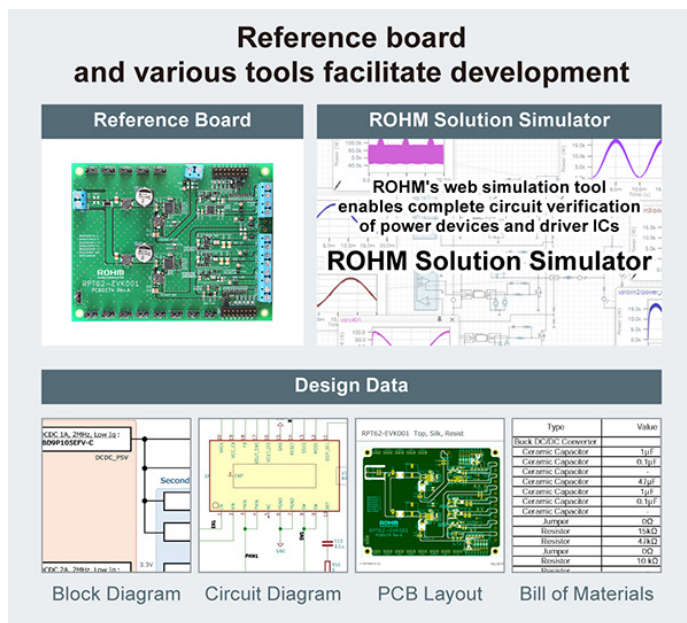
The BD9P series ensures stable operation during battery input voltage fluctuation, reducing output overshoot to less than 1/10th of that of conventional products. This eliminates the need for additional output capacitors typically required as countermeasure against overshoot. Additionally, adopting a new control method makes it possible to achieve both high efficiency and fast response (which typically represent a tradeoff). Not only does this provide a 92% power conversion efficiency at heavy loads (at 1A output current), but 85% efficiency at light loads (1mA) as well, ensuring leading-class efficiency across the entire load range. As a result, low power consumption is enabled both when driving and when the engine is stopped (standby current can be reduced).

Furthermore, combining the new product with the BD9S series of secondary DC/DC converters connected to the subsequent stage leads engineers to faster design of more efficient automotive power supply circuits. Reference designs are also available on ROHM official website. Utilizing reference boards, tools, and ROHM's free web simulation tool, ROHM Solution Simulator, it is possible to perform simulations close to actual conditions, significantly reducing application design resources. ROHM is committed to continuing to support the evolution of vehicles by developing products that contribute to lower power consumption and higher system reliability.



*"Nano Pulse Control™" is a trademark or a registered trademark of ROHM Co., Ltd.

Ensures stable operation even in the event of sudden battery voltage fluctuation (i.e. cranking).



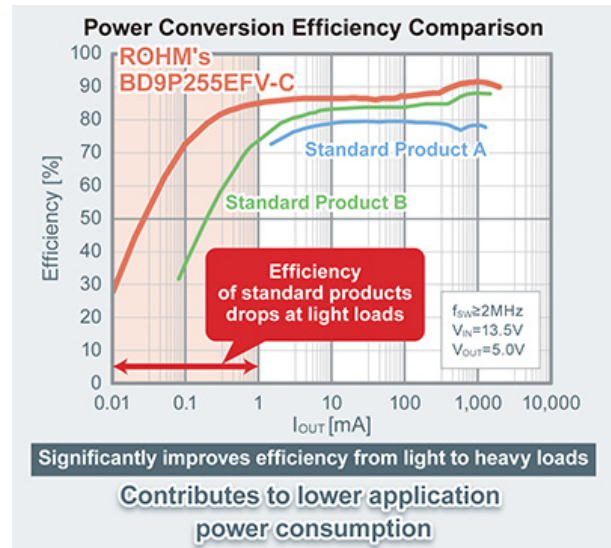
The new DC/DC converters leverage original Nano Pulse Control™ technology to achieve an unprecedented step-down ratio combined with stable operation and high efficiency. Qualification under the AEC-Q100 automotive standard has also been acquired, guaranteeing high reliability even under harsh vehicle environments.

1. Enabling stable operation without overshoot even during battery voltage fluctuations

ROHM's new products suppress voltage overshoot to less than 1/10th of that of conventional products when the input voltage drops below the output set voltage, keeping the output voltage to the specified voltage before fluctuation occurred. This allows users to eliminate additional capacitors typically required as a countermeasure for overshoot, ensuring stable operation even in the event of sudden battery voltage drop (i.e. cranking).

2. High efficiency over a wide range of load currents contributes to lower power consumption

These new power supply ICs simultaneously achieve high efficiency and fast response. Conventional power supply ICs require large drive currents to ensure fast response, making it difficult to provide both high efficiency and fast response at light loads. The BD9P series utilizes a new control method to deliver sufficiently faster response at lower drive currents than that of standard products. This translates to 92% conversion efficiency at heavy loads (at 1A output current) and 85% efficiency at light loads (1mA). Providing leading-class efficiency at both light and heavy loads reduces power consumption while driving as well as when the engine is stopped.



3. Nano Pulse Control™ ensures high step-down ratio and stable operation

Adopting original ultra-high speed pulse control technology, Nano Pulse Control™, enables high speed operation at 2.2MHz that will not interfere with the AM radio band (1.84MHz max.) Stable output of 3.3V~5.0V for driving latter stage devices can be achieved with an input of 40V max.. Additionally, a spread spectrum function is built in that reduces noise peaks, making them ideal for automotive applications exposed to high levels of radiated noise.

4. ROHM tools significantly reduce application development time

Using ROHM's reference designs together with ROHM Solution Simulator minimizes application development man-hours at each design stage (i.e. circuit/board/noise/thermal design, simulation).

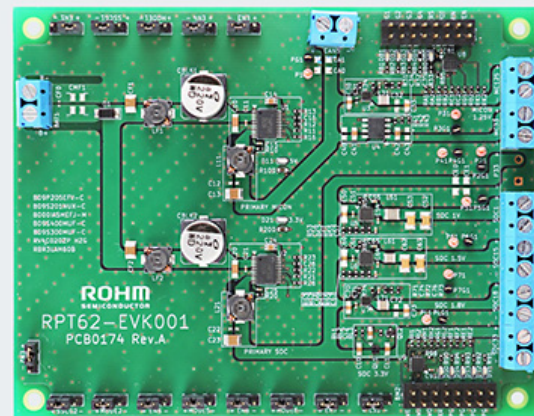
Reference Designs

The available reference designs (which include the BD9P series) have undergone thermal and EMC testing along with measurement of standard electrical characteristics, and cover power supply systems required for ADAS and infotainment functions. Furthermore, in addition to evaluation reports, various tools such as design data, onboard simulation models, and PCB CAD symbols are offered, facilitating evaluation when used with the REFRPT001-EVK-001 reference board.

Reference Design URL:

<https://www.rohm.com/support/power-managment-evk/solution>

Reference Board REFRPT001-EVK-001



Available Tools

- Design data (i.e. circuit schematics, BOM, PCB data)

- Simulation models (e.g. SPICE, thermal)
- PCB library (i.e. CAD tool symbols, footprints)

ROHM Solution Simulator

ROHM Solution Simulator is web simulation tool enables complete circuit verification of power devices (power semiconductors), driver ICs, and power management ICs on the solution circuits. ROHM supports development by offering reference circuits including the new products in the form of cut-out reference designs along with various tools.

ROHM Solution Simulator URL: <https://www.rohm.com/solution-simulator>

BD9P Series Product Lineup

This new series is offered in 3.3V/5.0V/variable output voltages to support a wide range of circuits.

Part No.	Absolute Max. Ratings	Input Voltage Range	Output Voltage	Max. Output Current	Output Voltage Accuracy	Operating Frequency	Operating Temp Range	Package
^{NEW} BD9P105MUF-C	42V	3.5V to 40.0	0.8V to 8.5V	1.0A	±1.75%	2.2MHz	-40°C to +125°C	VQFN20FV4040 (4.0x4.0x1.0mm)
^{NEW} BD9P135MUF-C			3.3V (Typ.)					
^{NEW} BD9P155MUF-C			5.0V (Typ.)					
^{NEW} BD9P205MUF-C			0.8V to 8.5V	2.0A				
^{NEW} BD9P235MUF-C			3.3V (Typ.)					
^{NEW} BD9P255MUF-C			5.0V (Typ.)					
^{NEW} BD9P105EFV-C			0.8V to 8.5V	1.0A				HTSSOP-B20 (6.5x6.4x1.0mm)
^{NEW} BD9P135EFV-C			3.3V (Typ.)					
^{NEW} BD9P155EFV-C			5.0V (Typ.)					
^{NEW} BD9P205EFV-C			0.8V to 8.5V	2.0A				
^{NEW} BD9P235EFV-C			3.3V (Typ.)					
^{NEW} BD9P255EFV-C			5.0V (Typ.)					

Application Examples

- ADAS sensors, cameras, and radars
- Car infotainment, instrument clusters, BCM (Body Control Modules), etc.
- Automotive applications requiring high efficiency, superior reliability, and greater compactness

Availability: In mass production

Nano Pulse Control™

Nano Pulse Control™ refers to ultra-fast pulse control technology achieved by combining three advanced analog technologies, circuit design, layout, and processes utilizing ROHM's vertically integrated production system. This allows a single power supply IC to convert from a high voltage to a low value, which previously required 2 or more ICs, contributing to greater miniaturization and simplification in applications that drive both 12V (i.e. gas-powered vehicles, xEVs) and 48V systems (e.g. mild hybrid vehicles, industrial robots, base station sub power supplies).

Terminology

Primary

In a power supply IC, the side in charge of 1st stage conversion from a power source such as a battery is called the primary. Similarly, the side responsible for 2nd stage conversion is called the secondary.

DC/DC Converter

A type of power supply ICs that convert one DC voltage to another. Also called switching regulators, generate an output voltage through switching operation. They are characterized by high power conversion efficiency, and are available in 2 types: a step-up (boost) configuration that increases the voltage and step-down (buck) topology that reduces the voltage.

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2020-10-20

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