Technical Article

How a Wide VIN Integrated Buck and LDO Can Power Your Automotive System – Part 2

Martin Asch

In part 1 of this series, I used an example application that required a high current at the higher-voltage rail and a low current at the lower-voltage rail. But what if the situation was reversed and only a small current is needed at the higher-voltage rail while most of the system load is supplied through the lower voltage rail?

A common requirement for automotive systems is to keep the communication, more often than not handled by a controller area network (CAN) transceiver running at 5V, alive even when the rest of the system is shut off – the perfect scenario for a standby low-dropout regulator (LDO) supplying a stable 5V rail. The other components of the system typically run at the same or a lower voltage but require a much higher current, such as a microcontroller, memory, light-emitting diode (LED) driver, motor driver, additional interfaces or point-of-load voltage regulators.

In this installment of my two-part series, the application example is an automotive head-up display (HUD). The HUD's power tree consists of two rails with different current requirements. The 5V rail needs a maximum of 100mA to supply an always-on CAN transceiver. All other loads are powered by the 3.3V rail. A low-voltage power-management integrated circuit (IC) running off the 3.3V rail and drawing up to 2A of current supplies the microprocessor and double data rate (DDR) memory as well as the rest of the system, as shown in Figure 1.

HUD units today often solve these requirements by utilizing a discrete buck and LDO solution, but the available space on top of the car dashboard is extremely limited. Every inch of saved board space directly benefits the passengers and increases the interior space of the car. Size really matters. By integrating the discrete solution into one chip and addressing the power tree with a combined step-down converter and LDO regulator, the solution size can be reduced by more than 25%.

When using an integrated solution, you don't need to sacrifice the benefits of a discrete implementation: Both the buck and LDO can activate separately and are capable of connecting straight to the battery, allowing for completely independent output voltages and maximum flexibility when supplying the power rails.

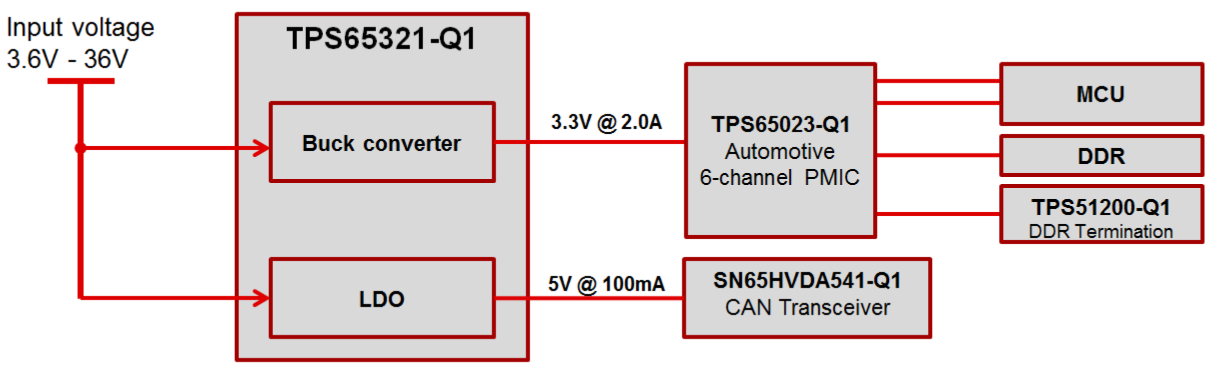

Figure 1. Automotive HUD Block Diagram

Additional Resources

- Download the TPS65023-Q1 and TPS65321-Q1 data sheets.
- Get started with the TPS65321EVM 36V step-down converter with Eco-mode™ control scheme and LDO regulator evaluation module.
- Read part 1 of this Behind the Wheel blog series.