

RAA271041

Cold Crank Boost and Buck Controller with Drivers for ASIL-D Automotive Applications

Description

The [RAA271041](#) is a controller for a dual regulator system capable of supporting ASIL-D automotive systems which must operate during battery dropout conditions. The Channel 2 boost regulator maintains the voltage rail which supplies the downstream Channel 1 buck regulator, allowing the buck output to maintain regulation during a battery dropout event such as cold cranking.

For Cold Crank applications, the Channel 2 Boost has an adjustable output and is active when the V_{BAT} input voltage falls below a user-programmable threshold. The boost channel can also be configured as an independent boost with separate Enable (WAKE2) control.

The boost output from Channel 2 supplies the input for Channel 1 buck. The buck output can be configured either as 3.3V, 5V, or as an adjustable voltage from 0.8V to 12V using a resistor divider.

The RAA271041 requires a typical input voltage of 5.5V at the VIN pin for start-up. The Channel 2 Boost has an input range from 2.1V to 42V while the Channel 1 Buck has an input range from 3.5V to 42V.

The RAA271041 buck channel can operate in Energy Conservation Mode (ECM) to reduce quiescent current draw to 8 μ A typical when no external load is applied. The buck switching frequency is factory programmable to 440kHz or 2.2MHz. The boost switching frequency is also factory programmable to 440kHz, or 2.2MHz if the buck channel is also set to 2.2MHz. Optional spread spectrum operation is available to reduce EMI and noise levels.

Features

- ASIL-D Functional Safety
- 40V boost and buck integrated driver controller
- FET drivers support source/sink current of 2A/3A
- Low I_Q with ECM mode of 8 μ A typical (buck Channel 1 only)
- Separate or Combined Wake (Enable) inputs for each channel
- Minimized FET ON and OFF times (25ns and 45ns)
- High-efficiency buck exceeding 80% at 10mA
- Buck frequency options 440kHz or 2.2MHz
- Boost frequency options 440kHz or 2.2MHz (2.2MHz Boost requires 2.2MHz Buck frequency)
- VBATS sense for Boost Enable during Cold Crank
- Optional pseudo-random spread spectrum clocking
- External synchronization using SYNC pin
- Dual Over-temperature protection monitors
- Extensive protection mechanisms for OV/UV/OC/OT
- 6x6mm 36Ld SC-QFN package
- [AEC-Q100](#) grade 1 qualified
- Functional Safety Features
 - Built-in Self Test (LBIST and ABIST) at power up
 - Recurring Checks: Internal References, PWM clock, System Clock, PGND/AGND connection, Dual Over-Temperature monitor, VCC supply, Logic Pin Stuck Low.
 - Independent References and feedback sense paths for Buck and Boost OV/UV detection
 - Independent Fault Indicators for Buck and Boost
 - Fail-Safe Output, logic high indicates a trusted device state and all safety monitors are active.

Applications

- Automotive battery supplied applications
- In cabin systems
- ADAS: Advanced Driver Assist Systems
- Start-stop protected systems (such as head unit, cluster, e-Mirror)

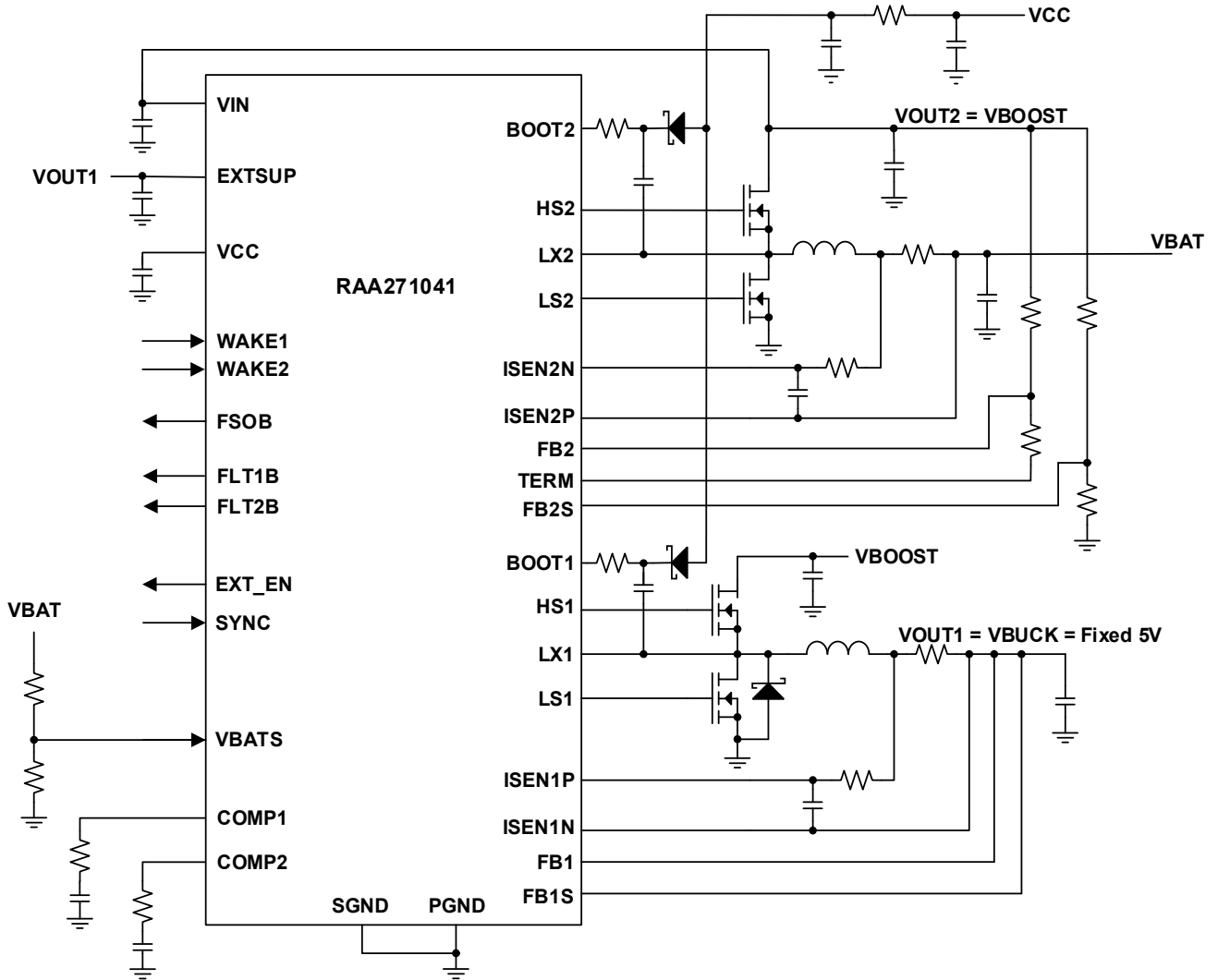


Figure 1. Typical Cold Crank Applications Schematic (Channel 1 Fixed at 5V)

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Corporate Headquarters

TOYOSU FORESIA, 3-2-24 Toyosu,
Koto-ku, Tokyo 135-0061, Japan
www.renesas.com

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