Four-/Three-Output Mini PMICs for Safety Applications

MAX20431/MAX20432

General Description

The MAX20431/MAX20432 are high-efficiency, four-/three-output DC-DC converters with a windowed watchdog. The OUT1 is a synchronous step-down converter that converts vehicle battery voltage to 3.3V at up to 2.5A. The OUT3 boosts the OUT1 to 5V at up to 500mA, while the OUT2/OUT4 (MAX20431) or OUT2 (MAX20432) low-voltage synchronous step-down converters operate from OUT1 and provide a 0.5V to 3.6875V output voltage range at up to 3A. All outputs achieve ±1.5% output error over load, line, and temperature range.

The devices feature a 2.1MHz fixed-frequency PWM mode for all DC-DC outputs for better noise immunity and load-transient response. The 2.1MHz frequency operation allows for the use of all ceramic capacitors and minimizes the external components. The programmable spread-spectrum frequency modulation minimizes the radiated electromagnetic emissions. Integrated low R_{DSON} switches improve efficiency at heavy loads and make the layout much simpler with respect to discrete solutions.

The devices features the MAXQ® power architecture, which provides precision transient performance and phase margin. This allows to obtain the maximum power, performance, and precision while minimizing system cost for any specific application.

The devices are offered with factory-preset output voltages. Other features include soft-start, overcurrent, and overtemperature protection.

Applications

- Advanced Driver-Assistance Systems (ADAS)

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***Ordering Information* appears at end of data sheet.**

Benefits and Features

- Multiple Functions for Small Size
  - Synchronous High-Voltage Buck Converter up to 2.5A
    - Input Voltage Range 3.5V to 40V
    - Output Voltage of 3.3V
  - 5V Synchronous 500mA Boost Converter
  - Dual (MAX20431)/Single (MAX20432) Synchronous Buck Converters up to 3A
    - 0.5V to 3.6875V in 12.5mV Steps
  - Flexible Power Sequencer
  - Programmable Challenge/Response or Windowed Watchdog
  - Two Free Programmable UV/OV Voltage Monitors
    - 0.8V to 3.9875V in 12.5mV Steps
  - I^2C Fast-Mode Plus Compatible Interface with Packet Error-Checking Option (PEC)
  - 2.1MHz Internal Operation with Spread-Spectrum Option
  - $\overline{RESET}$ Output
  - Current-Mode, Forced-PWM Operation
- High-Precision for ASIL Applications
  - ±1.5% Output Voltage Accuracy
  - ±1% OV/UV Monitoring
  - MAXQ Power Architecture
- Diagnostics and Redundant Circuits
  - ASIL C Compliant
  - Redundant Reference
  - BIST Diagnostics
  - Fail-Safe on Open Pins
  - Shorted Pin Detection on $\overline{RESET}$
- Mount ID Location Detection
- Robust for the Automotive Environment
- Overtemperature and Short-Circuit Protection
- 5mm x 5mm, Side-Wettable TQFN Package
- -40°C to +125°C Grade 1 Automotive Temperature Range

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19-101490; Rev 18; 5/25

Simplified Block Diagram