DA9210

12 A multi-phase DC-DC buck converter

The DA9210 is a synchronous 12 A step-down converter typically supplying high current processor core rails in smartphones, tablets, Ultrabooks™, automotive, and embedded applications. The DA9210 is also suitable for powering high-end FPGAs.

The benefits of the DA9210 quad-phase buck converter include: low-profile <1 mm, 0.47 µH inductors; high efficiency over wide load conditions; and low level output ripple. The buck is capable of delivering up to 12 A continuous output current at an output voltage range of 0.3 V to 1.57 V.

The latest multi-core processors transition from sleep to full load mode in microseconds: the DA9210 has a load transient response of 10 A/µs that exceeds these most demanding requirements.

The input voltage range of 2.8 V to 5.5 V makes it suitable for use in single-cell Li-Ion battery applications or in applications powered by standard 5 V or USB power supplies. Two DA9210s can be used in parallel to deliver 24 A output current, suitable for the highest performing processors, such as those utilizing multiple ARM Cortex A15™ cores. Phase-shedding delivers higher efficiency at lower load currents by disabling phases when necessary.
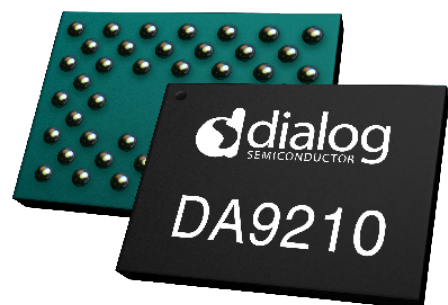
The DA9210 point-of-load remote-sensing feature ensures maximum accuracy while supporting multiple PCB routing scenarios without loss of performance. The highly-integrated design removes the need for external switching FETs or Schottky diodes.

A programmable soft-start feature is available to limit the supply inrush current. This is achieved by controlling the slew-rate of the output during start-up of the rail.
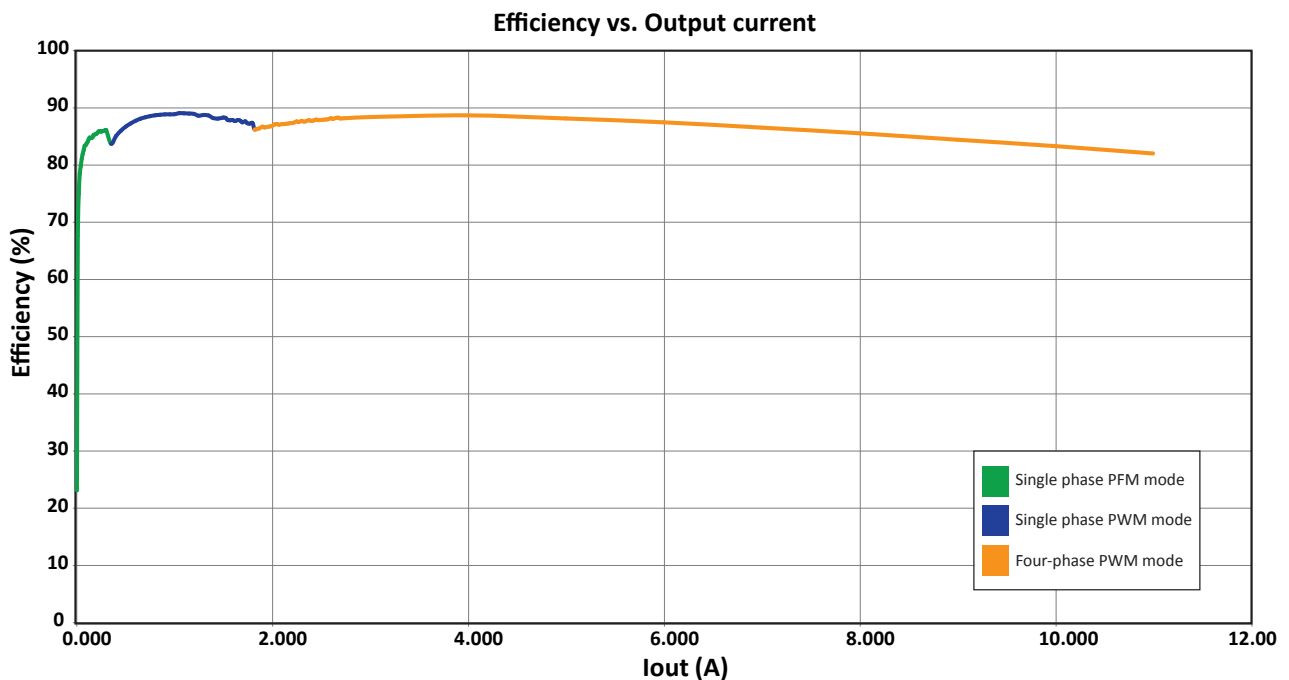
Dynamic Voltage Scaling (DVS) supports adaptive adjustment of the supply voltage dependent on the processor load. The DA9210 offers three control options for DVS: direct register write through the communication interface (I^2C or SPI compatible), a dedicated DVS control interface, or by using a GPIO.

For increased system reliability the DA9210 has integrated over-temperature and over-current protection. To allow the processor to manage the regulator load, 'Power-Good and Over-Current' signals informs the processor when the buck voltage is out of range or if the current exceeds a programmable limit.

The DA9210 sub-PMIC is designed to operate seamlessly with Dialog system PMICs such as DA9061, DA9062, and DA9063. It is also available in automotive grade to AEC-Q100 Grade 3 (DA9210-A).

4 mm x 3 mm WLCSP consumer and 42 BGA 5.6 mm x 4.8 mm 0.8 mm pitch automotive package options
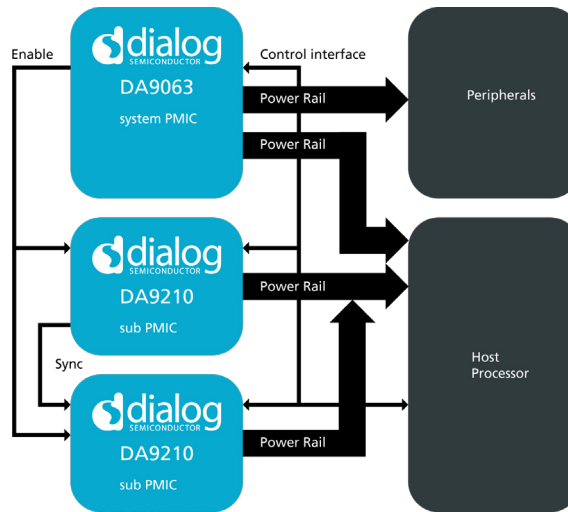
www.dialog-semiconductor.com

Efficiency vs. Output current

Legend:
- Single phase PFM mode
- Single phase PWM mode
- Four-phase PWM mode

Axes: Efficiency (%) vs. Iout (A)

DA9210 high efficiency achieved through phase-shedding. V_{in}=3.6 V, V_{out}=1.0 V

Features

- 2.8 V to 5.5 V input voltage
- 0.3 V to 1.57 V output voltage
- 12 A output current
- 24 A output current in parallel configuration
- 3 MHz nominal switching frequency
  - Enables use of low-profile inductors
- Output voltage accuracy ±2.5 %
- Dynamic Voltage Scaling (DVS)
- Automatic phase-shedding
- Integrated power switches
- Remote-sensing at point-of-load
- Adjustable soft-start
- Power-Good and Over-Current signal

- Interfaces:
  - I^2C and SPI
  - Dedicated DVS
  - GPIO
- –40 ºC to +125 ºC junction temperature operation
- Regulator supervision with automatic under- and over-voltage protection
- Coin cell/super-capacitor backup charger
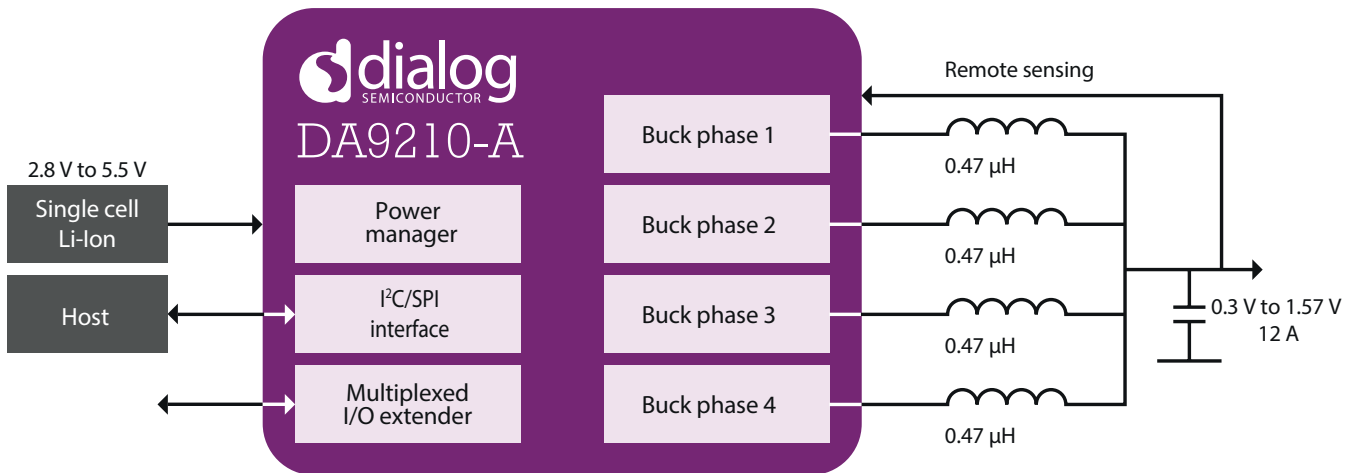- Automotive AEC-Q100 Grade 3 option (DA9210-A), package 42 BGA 0.8 mm pitch

Typical applications

- High performance multi-core system-on-chip (SoC) applications
- Smartphones
- Mobile phones
- Ultrabooks™
- Tablet PCs
- In-car infotainment/dashboard

- Portable navigation devices
- Full-scale integrated cockpits
- Heads-up displays (HUDs)
- Telematics
- TV and media players
- Embedded industrial systems

www.dialog-semiconductor.com

DA9210 system diagram

Block diagram