

## DA9068

### System Power Management IC (PMIC) for Multi-Core Application Processors

**DA9068 is a power management unit (PMU) optimized for supplying systems with multi-core CPUs, I/O, DDR memory, and peripherals.**

The PMIC features dual-phase, single-phase, and RF buck converters. High efficiency is achieved over a wide load range. All power switches are integrated and a high switching frequency allows low-profile inductors to be used.

DA9068 also includes additional modules such as real time clock (RTC), general purpose 12-bit ADC (GPADC) and general purpose I/O pins (GPIO). These support different functions such as battery voltage supervision and device over-temperature protection. All DA9068 features can be accessed by software via the host processor, allowing high flexibility of applications.

Controlled by a programmable digital power manager, the user-programmable switched/linear regulators may be configured to meet the start-up sequence, voltage, and timing requirements for most applications. Dynamic Voltage Scaling (DVS) is available to achieve optimal processor energy-per-task performance. Dialog's patented **SmartMirror™** dynamic biasing is implemented on all linear regulators.

Dynamic voltage control (DVC) allows supply voltages of DA9068 to be controlled dynamically according to the operating point of the system. The control can be realized via direct register writes through the I<sup>2</sup>C interface or via GPIOs.



*Available in WLCSP,  
4 mm x 6 mm, 0.4 mm pitch*

## Features

- ▶ Input voltage 2.8 V to 4.5 V
- ▶ Eight buck converters with dynamic voltage control
  - 2 x 4000 mA Dual-phase
  - 1 x 1500 mA
  - 1 x 1000 mA
  - 3 x 600 mA
  - 1 x 1000 mA
- ▶ 25 LDO regulators
  - 8 x 150 mA
  - 6 x 200 mA
  - 8 x 300 mA
  - 3 x 400 mA
- ▶ Programmable power-mode sequencer
- ▶ System supply and junction temperature monitoring
- ▶ 12-bit general purpose ADC
- ▶ Coin cell/super-capacitor charger
- ▶ Ultra-low-power real-time clock with alarm
- ▶ 32 kHz oscillator with an external crystal
- ▶ -30 °C to +85 °C temperature range
- ▶ WLCSP, 4 mm x 6 mm, 0.4 mm pitch

## Applications

- ▶ Supply for multi-core application processors
- ▶ Smartphones and tablets

## Block Diagram



## Generated Supply Domains

| Block               | Supplied Voltage (V) | Supplied Max. Current (A) | External Components                            | Notes                           |
|---------------------|----------------------|---------------------------|--|---------------------------------|
| Buck0<br>Dual-Phase | 0.6 to 1.4           | 4.0                       | L = 1.0 $\mu$ H, C <sub>OUT</sub> = 22 $\mu$ F | 3 MHz, 6.25 mV steps            |
| Buck1<br>Dual-Phase | 0.6 to 1.4           | 4.0                       | L = 1.0 $\mu$ H, C <sub>OUT</sub> = 22 $\mu$ F | 3 MHz, 6.25 mV steps            |
| Buck2               | 0.6 to 1.4           | 1.5                       | L = 2.2 $\mu$ H, C <sub>OUT</sub> = 10 $\mu$ F | 2 MHz, 6.25 mV steps            |
| Buck3               | 0.6 to 1.4           | 1.0                       | L = 2.2 $\mu$ H, C <sub>OUT</sub> = 10 $\mu$ F | 2 MHz, 6.25 mV steps            |
| Buck4               | 1.4 to 2.2           | 0.6                       | L = 2.2 $\mu$ H, C <sub>OUT</sub> = 10 $\mu$ F | 2 MHz, 6.25 mV steps            |
| Buck5               | 1.4 to 2.2           | 0.6                       | L = 2.2 $\mu$ H, C <sub>OUT</sub> = 10 $\mu$ F | 2 MHz, 6.25 mV steps            |
| Buck6               | 1.4 to 2.2           | 0.6                       | L = 2.2 $\mu$ H, C <sub>OUT</sub> = 10 $\mu$ F | 2 MHz, 6.25 mV steps            |
| Buck7<br>RF Buck    | 0.9                  | 1.0                       | L = 1.0 $\mu$ H, C <sub>OUT</sub> = 10 $\mu$ F | Fast voltage transient response |
| LDO1                | 0.65 to 2.25         | 0.15                      | C <sub>OUT</sub> = 1 $\mu$ F                   | Low Voltage, 25 mV steps        |
| LDO2                | 0.65 to 2.25         | 0.15                      | C <sub>OUT</sub> = 1 $\mu$ F                   | Low Voltage, 25 mV steps        |
| LDO3                | 1.2 to 3.3           | 0.15                      | C <sub>OUT</sub> = 1 $\mu$ F                   | 50 mV steps                     |
| LDO4                | 0.65 to 1.7          | 0.15                      | C <sub>OUT</sub> = 1 $\mu$ F                   | Low Voltage, 25 mV steps        |
| LDO5                | 1.2 to 3.3           | 0.15                      | C <sub>OUT</sub> = 1 $\mu$ F                   | 50 mV steps                     |
| LDO6                | 1.2 to 3.3           | 0.15                      | C <sub>OUT</sub> = 1 $\mu$ F                   | 50 mV steps                     |
| LDO7                | 1.2 to 3.3           | 0.2                       | C <sub>OUT</sub> = 1 $\mu$ F                   | 50 mV steps                     |
| LDO8                | 1.2 to 3.3           | 0.3                       | C <sub>OUT</sub> = 2.2 $\mu$ F                 | 50 mV steps                     |
| LDO9                | 1.2 to 3.3           | 0.2                       | C <sub>OUT</sub> = 1 $\mu$ F                   | 50 mV steps                     |
| LDO10               | 1.2 to 3.3           | 0.2                       | C <sub>OUT</sub> = 1 $\mu$ F                   | 50 mV steps                     |

| Block | Supplied Voltage (V) | Supplied Max. Current (A) | External Components       | Notes                    |
|-------|----------------------|---------------------------|---------------------------|--------------------------|
| LDO11 | 1.2 to 3.3           | 0.3                       | C <sub>OUT</sub> = 2.2 μF | 50 mV steps              |
| LDO12 | 1.2 to 3.3           | 0.4                       | C <sub>OUT</sub> = 2.2 μF | 50 mV steps              |
| LDO13 | 1.2 to 3.3           | 0.15                      | C <sub>OUT</sub> = 1 μF   | 50 mV steps              |
| LDO14 | 1.2 to 3.3           | 0.15                      | C <sub>OUT</sub> = 2.2 μF | Low Noise, 50 mV steps   |
| LDO15 | 1.2 to 3.3           | 0.4                       | C <sub>OUT</sub> = 2.2 μF | 50 mV steps              |
| LDO16 | 1.2 to 3.3           | 0.3                       | C <sub>OUT</sub> = 2.2 μF | 50 mV steps              |
| LDO17 | 1.2 to 3.3           | 0.3                       | C <sub>OUT</sub> = 2.2 μF | 50 mV steps              |
| LDO18 | 1.2 to 3.3           | 0.3                       | C <sub>OUT</sub> = 2.2 μF | 50 mV steps              |
| LDO19 | 1.2 to 3.3           | 0.3                       | C <sub>OUT</sub> = 2.2 μF | 50 mV steps              |
| LDO20 | 1.2 to 3.3           | 0.3                       | C <sub>OUT</sub> = 2.2 μF | 50 mV steps              |
| LDO21 | 1.2 to 3.3           | 0.2                       | C <sub>OUT</sub> = 1 μF   | 50 mV steps              |
| LDO22 | 1.2 to 3.3           | 0.2                       | C <sub>OUT</sub> = 1 μF   | 50 mV steps              |
| LDO23 | 1.2 to 3.3           | 0.2                       | C <sub>OUT</sub> = 1 μF   | 50 mV steps              |
| LDO24 | 1.0 to 3.1           | 0.3                       | C <sub>OUT</sub> = 2.2 μF | Low Voltage, 50 mV steps |
| LDO25 | 1.2 to 3.3           | 0.4                       | C <sub>OUT</sub> = 2.2 μF | 50 mV steps              |

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