

ABSTRACT

A capacitor-less low drop-out voltage regulator with fast transient response

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Power management has had an ever increasing role in the present electronic industry. Battery powered and handheld applications require power management techniques to extend the life of the battery and consequently the operation life of the device. Most systems incorporate several voltage regulators which supply various subsystems and provide isolation among such subsystems. Low dropout (LDO) voltage regulators are generally used to supply low voltage, low noise analog circuitry. Each LDO regulator demands a large external capacitor, in the range of a few microfarads, to perform. These external capacitors occupy valuable board space, increase the IC pin count, and prohibit system-on-chip (SoC) solutions. The presented research provides a solution to the present bulky external capacitor LDO voltage regulators with a capacitor-less LDO architecture. The large external capacitor was completely removed and replaced with a reasonable 100pF internal output capacitor, allowing for greater power system integration for SoC applications. A new compensation scheme is presented that provides both a fast transient response and full range ac stability from a 0mA to 50mA load current. A 50mA, 2.8V, capacitor-less LDO voltage regulator was fabricated in a TSMC 0.35um CMOS technology, consuming only 65uA of ground current with a dropout voltage of 200mV. Experimental results show that the proposed capacitor-less LDO voltage regulator exceeds the current published works in both transient response and ac stability. The architecture is also less sensitive to process variation and loading conditions. Thus, the presented capacitor-less LDO voltage regulator is suitable for SoC solutions.