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Technology Transfer Office

System and Method for Voltage Regulator-Gating

Researchers at the University of South Florida have developed a regulator-gating technique that improves the on-chip voltage conversion efficiency.

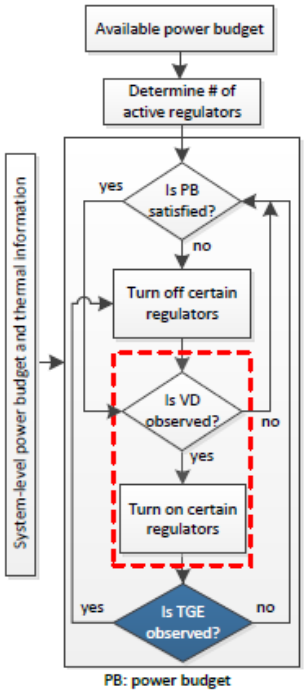
Design-for-power has become one of the primary objectives with the continuous demand to improve the battery life of mobile devices or minimize the cooling costs of servers. To save power and mitigate thermal emergencies, circuits typically enter reduced power states when the workload is light. Voltage regulators, however, operate indifferently under varying workload conditions due to the lack of different operating modes. When a voltage regulator is optimized for a particular load current, significant power is dissipated during voltage conversion while delivering a different load current. Adaptive activity management of on-chip voltage regulators based upon the workload information can be exploited to force each on-chip regulator to operate in its most power-efficient load current.

USF inventors have developed a regulator-gating technique, whereby regulators are adaptively turned on/off when the current demand is high/low to improve the voltage conversion efficiency. With this technique, the overall voltage conversion efficiency from the battery or off-chip power supply to the output of on-chip voltage regulators is improved by 5% to 20% as well as providing fast turn on capability.

ADVANTAGES:

- **Significantly better power efficiency**
- **Fast turn on capability**
- **Decreased thermal gradient**

Improved Voltage Conversion Efficiency



PB: power budget
TGE: thermal gradient or emergency
VD: voltage droop

Regulator Gating Technique

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