Technology Summary

UTSA RESEARCH
Office of Commercialization and Innovation

Stabilized Power Driver for Near Threshold Voltage Operation

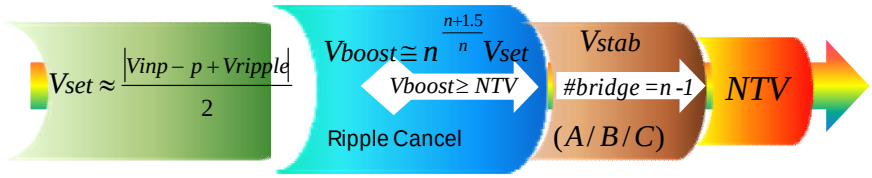
Tubes were replaced by Silicon Bipolar transistors and later replaced by MOSFETS and CMOS technology. While the industry continues to search for new energy efficient technologies, near-threshold voltage (NTV) offers the possibility of achieving the desired 10x energy efficiency through low voltage and parallel operations across all computing and control system platforms. In addition, sub-threshold voltage (Sub-Vth) power design enables these systems capable of running even at lower voltages.

Researchers at UT San Antonio have developed ASIC of SoC for a Stabilized Non-Inductive Voltage Boost Converter (S-NVBC) module that is capable of delivering the necessary power from various Sub-Vth sources effectively to those computing and control system platforms and improving the energy efficiency even higher. Furthermore, the S-NVBC has resolved whereas most other commercial power systems often pose challenges of inductors, high-speed clock circuits and complex designs.

The new design consists of boost conversion sequence on parallel rails where input voltage can be as low as 0.14V. Its special features include:

1. Directional dual current paths in each rail create the stage of voltage step-up efficiently at NTV.
2. SoC design compactness is optimized for min. components: $4CN_0 + (4P+4C)N_{1,m-1} + 4PN_m + miR + mjC + mk(R+C)$
3. Energy density is increased and stabilized by *n-1* bridges in rails.
4. Safe and stable operation is assured at floating ground to those computing and control system platforms.
5. Application Specific S-NVBC is offered by types of A, B and C.

The S-NVBC consists of four simple steps, shown below.



MEET THE INVENTOR

Dr. Shuza Binzaid is a researcher and the Faculty Associate of MeMDRL-UTSA. He has more than ten years of industry experiences in Semiconductor Technology for devices, VLSI ASIC design, fabrication process and testing. He also has extensive design experiences in energy harvesting systems. He is a pioneer in Microelectronics and specializes in design engineering of novel systems and applications. Learn more about Dr. Binzaid at http://engineering.utsa.edu/~memdrl/

COMPETITIVE ADVANTAGES

- Compact and reliable SoC design for voltage step-up.
- Very high efficiency above 86.5%.
- Supports application specific designs with power stabilization process.
- Eliminates the need for complex high-speed clock circuitry.
- NTV is assured even when source voltage at sub-Vth.
- Bidirectional current paths form proper charge delivery without any current leakage i.e. power loss.
- Dedicated ground is assigned for the CMOS computing and control platforms.
- High efficiency for μ-power systems.

COMMERCIAL APPLICATIONS

- Very suitable for μ-power CMOS technology.
- Sub-V_{th} energy is applicable for NTV platforms.
- Suitable for direct driving systems.
- Highly adaptive in renewable energy harvesting systems.

IP STATUS

- Patent Pending
- Licenses Available

PROTOTYPE STATUS

- Hardware prototype is complete.
- Electrical test and characterization is complete.
- SoC design is complete.

CONTACT INFORMATION

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