

CPES AT VIRGINIA TECH

VOLTAGE REGULATOR CHIP

PROJECT TITLE: Power Supplies on a Chip

ORGANIZATION: Center for Power Electronics Systems
(CPES) at Virginia Polytechnic Institute and
State University (Virginia Tech)

LOCATION: Blacksburg, VA

PROGRAM: ADEPT

ARPA-E AWARD: \$1,000,000

TECH TOPIC: Power Electronics

PROJECT TERM: 9/1/10 – 8/31/12

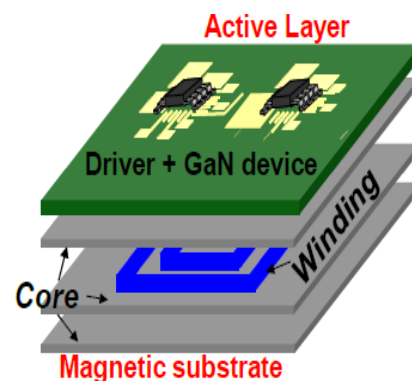
WEBSITE: www.cpes.vt.edu

CRITICAL NEED

All electric devices are built to operate with a certain type and amount of electrical energy, but this is often not the same type or amount of electrical energy that comes out of the outlet in your wall. Power converters modify electrical energy from the outlet to a useable current, voltage, and frequency for an electronic device. Power stations also use power converters on a larger scale to modify electrical energy so it can be efficiently transmitted. Today's power converters are inefficient because they are based on decades-old technologies and rely on expensive, bulky, and failure-prone components. Within the next 20 years, 80% of the electricity used in the U.S. will flow through these devices, so there is a critical need to improve their efficiency.

PROJECT INNOVATION + ADVANTAGES

CPES at Virginia Tech is finding ways to save real estate on a computer's motherboard that could be used for other critical functions. Every computer processor today contains a voltage regulator that automatically maintains a constant level of electricity entering the device. These regulators contain bulky components and take up about 30% of a computer's motherboard. CPES at Virginia Tech is developing a voltage regulator that uses semiconductors made of gallium nitride on silicon (GaN-on-Si) and high-frequency soft magnetic material. These materials are integrated on a small, 3D chip that can handle the same amount of power as traditional voltage regulators at 1/10 the size and with improved efficiency. The small size also frees up to 90% of the motherboard space occupied by current voltage regulators.



IMPACT

If successful, CPES at Virginia Tech would help create more compact and efficient electronic devices.

- **SECURITY:** This project could help ensure the U.S. continues leading the world in the development of advanced computer, telecommunication, and mobile equipment.
- **ENVIRONMENT:** This project would reduce the size of electronic devices, which in turn reduces electronic waste.
- **ECONOMY:** This project could reduce computer prices for consumers, reestablish the U.S. power management integrated circuit industry as a technological leader, and stimulate further growth of other domestic information technology (IT) industries.
- **JOBS:** This project could create jobs in industries like IT, manufacturing, and computer engineering.

CONTACTS

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