Advanced Research Projects Agency • ENERGY

ADEPT PROJECT

MIT

ADVANCED POWER ELECTRONICS FOR LED DRIVERS

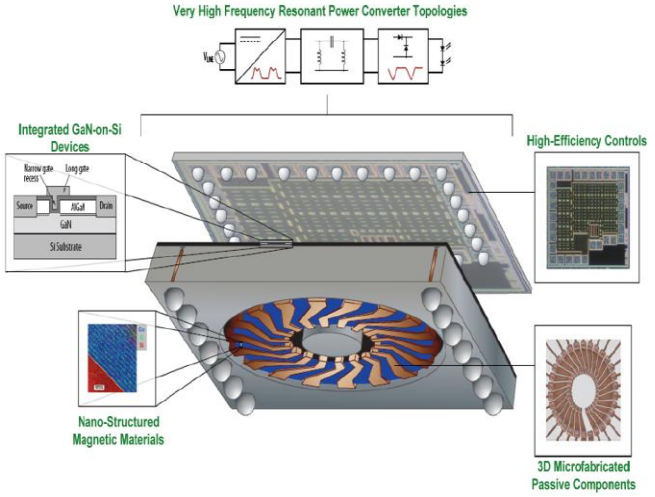
PROJECT TITLE:	Advanced Technologies for Integrated Power Electronics		
ORGANIZATION:	Massachusetts Institute of Technology (MIT)	LOCATION:	Cambridge, MA
PROGRAM:	ADEPT	ARPA-E AWARD:	$4,414,003
TECH TOPIC:	Other	PROJECT TERM:	9/1/10 - 8/31/13
WEBSITE:	www.arpa-e.energy.gov/ProgramsProjects/ADEPT.aspx		

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 to a useable current, voltage, and frequency for an electronic device. Today's power converters are large and 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 size and efficiency.

PROJECT INNOVATION + ADVANTAGES

MIT is teaming with Georgia Institute of Technology, Dartmouth College, and the University of Pennsylvania (UPenn) to create more efficient power circuits for energy-efficient light-emitting diodes (LEDs) through advances in 3 related areas. First, the team is using semiconductors made of high-performing gallium nitride grown on a low-cost silicon base (GaN-on-Si). These GaN-on-Si semiconductors conduct electricity more efficiently than traditional silicon semiconductors. Second, the team is developing new magnetic materials and structures to reduce the size and increase the efficiency of an important LED power component, the inductor. This advancement is important because magnetics are the largest and most expensive part of a circuit. Finally, the team is creating an entirely new circuit design to optimize the performance of the new semiconductors and magnetic devices it is using.



IMPACT

If successful, MIT's new LED power circuits would increase the efficiency and decrease the cost of energy-efficient LED lights, helping to facilitate their widespread use.

- SECURITY: This project would help contribute to a smarter, more advanced, and more reliable grid.
- ENVIRONMENT: This project would drive adoption of energy-efficient lighting, in turn reducing pollution and harmful emissions.
- ECONOMY: This project could cut the cost of an LED circuit by 50%—reducing the cost of energy-efficient lighting for consumers.
- JOBS: Projects like this could create high-skill jobs in fields like engineering, research, and manufacturing.

CONTACTS

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