

ADEPT PROJECT

TRANSPHORM

TRANSISTORS FOR ELECTRIC MOTOR DRIVES

PROJECT TITLE:	High Performance GaN HEMT Modules for Agile Power Electronics		
ORGANIZATION:	Transphorm, Inc.	LOCATION:	Goleta, CA
PROGRAM:	ADEPT	ARPA-E AWARD:	\$2,950,000
TECH TOPIC:	Electricity Transmission Distribution	PROJECT TERM:	9/1/10 – 2/28/13
WEBSITE:	www.transphormusa.com		

CRITICAL NEED

All electronic 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

Transphorm is developing transistors with gallium nitride (GaN) semiconductors that could be used to make cost-effective, high-performance power converters for a variety of applications, including electric motor drives which transmit power to a motor. A transistor acts like a switch, controlling the electrical energy that flows around an electrical circuit. Most transistors today use low-cost silicon semiconductors to conduct electrical energy, but silicon transistors don't operate efficiently at high speeds and voltage levels. Transphorm is using GaN as a semiconductor material in its transistors because GaN performs better at higher voltages and frequencies, and it is more energy efficient than straight silicon. However, Transphorm is using inexpensive silicon as a base to help keep costs low. The company is also packaging its transistors with other electrical components that can operate quickly and efficiently at high power levels—increasing the overall efficiency of both the transistor and the entire motor drive.

IMPACT

If successful, Transphorm's transistors would improve the energy efficiency of electric motor drives by 2-8%.

- **SECURITY:** Efficient, variable speed motor drives could help reduce peak power demand, increasing the reliability of the power grid.
- **ENVIRONMENT:** The energy savings from more efficient motor drives could power 13 million homes.
- **ECONOMY:** More efficient motor drives in the U.S. alone could save over \$13 billion annually—money that could be spent to get the economy back on track.
- **JOBS:** This project could create jobs in manufacturing and engineering.

CONTACTS

ARPA-E Program Director:
Dr. Tim Heidel,
timothy.heidel@hq.doe.gov

Project Contact:
Dr. Primit Parikh,
pparikh@transphormusa.com