Inverter Uses SiC JFETs for Higher Power Density

SemiSouth Laboratories, a leading manufacturer of silicon carbide (SiC) transistor technology for high-power, high-efficiency, harsh-environment power management and conversion applications, has announced that silicon carbide JFETs made by the company are being used in small 0.5 litre inverters to achieve an output power density of 30kWh/l. If inverters of this size and capacity are used with PV panels, one inverter could supply enough electricity for up to five households, it is claimed.

A team at the Japanese academia and industry R&D Partnership for Future Power Electronics Technology (FUPET), consisting of participants from Fuji Electric, Nissan Motor, Sanken Electric and Toshiba, aims to deliver power converters that operate at high temperature with high output power density. Using SiC JFETs from SemiSouth Laboratories, the team developed a three-phase 500cc inverter that delivers 15kW output power when connected to a three-phase motor with a conversion efficiency of 99%. Featuring a compact, optimized cooling system, the power modules can operate at up to 200degC. (See reference below).

"We believe this is the world's highest output power density for a small-volume inverter," said Satoshi Tanimoto, chief researcher at FUPET's R&D Center. “SemiSouth’s JFETs have been instrumental in helping us maximize efficiency and power density.”

SemiSouth’s JFETs are compatible with standard gate driver ICs, and feature a positive temperature coefficient for ease of paralleling; extremely fast switching with no ‘tail’ current at up to a maximum operating temperature of 150degC and a low RDS(on)max. Devices are available in TO-247 packaging and in some cases they are also available in die form for integration into modules. Commented Jeff Casady, President and CTO: “The FUPET team achieved these results at 50 kHz

which is their minimum frequency target, and the module also has a very low inductance module with only 5 nH. It is exciting to see the results that can be achieved using our technology." The FUPET team aims to achieve an inverter with 40kW/l output power density next year.

Reference:
Shinji Sato et al, Yusuke Zushi, Kohei Matsui, Yoshinori Murakami and Satoshi Tanimoto: ICSCRM2011, Tu-P-23.

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