Module Integrated GaN Power Stage for High Switching Frequency Operation

An increased attention has been detected to develop smaller and lighter high voltage power converters in the range of 50 V to 400 V domains. The applications for these converters are mainly focused for Power over Ethernet (PoE), LED lighting and ac adapters. Design for high power density is one of the targets for next generation power converters. This paper presents an 80 V input capable multi-chip module integration of enhancement mode gallium nitride (GaN) field-effect transistors (FETs) based power stage. The module design is presented and validated through experimental results. The power stage is integrated on a high glass transition temperature 0.4 mm thick FR4 substrate configured as a 70 pin ball grid array package. The power stage is tested up to switching frequency of 12 MHz. The power stage achieved 88.5 % peak efficiency when configured as a soft switching buck converter operating at 7 MHz. The converter is tested up to 12 W of output power at 13 V ± 1.5 V output voltage. The converter achieved a volume power density of 20 W/cm³ and area power density of 9.4 W/cm².

General information
Publication status: Published
Organisations: Department of Electrical Engineering, Electronics
Contributors: Nour, Y., Knott, A.
Pages: 848-852
Publication date: 2017

Host publication information
Title of host publication: Proceedings of the 12th IEEE International Conference on Power Electronics and Drive Systems (PEDS 2017)
Publisher: IEEE
ISBN (Electronic): 978-1-5090-2364-6
DOI: 10.1109/PEDS.2017.8289242
Research output: Chapter in Book/Report/Conference proceeding – Article in proceedings – Annual report year: 2017 – Research – peer-review