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Guidelines for representing switching losses of SIC MOSFETs in datasheets

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IEC Secretariat
3, rue de Varembé
CH-1211 Geneva 20
Switzerland

Tel.: +41 22 919 02 11
info@iec.ch
www.iec.ch

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Draft	Report on voting
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– reconfirmed,
– withdrawn, or
– revised.

INTRODUCTION

This document is intended for use in the SiC power semiconductor and related power electronic industries and provides guidelines for representation of switching losses and related measurement conditions on SiC MOSFET device datasheets.

Switching losses are key parameters for evaluating power device performance, for benchmarking devices of different manufacturers and deciding on the suitability of a device in an application. Measurement and/or setup parameters can have a significant influence on the measured switching losses. Without clear definition of the methodology used, it is not possible to compare devices properly or, in some cases, even decide on its suitability for the target purpose.

The purpose of this document is to point out the factors that can influence switching losses for silicon carbide (SiC) metal-oxide-semiconductor field-effect transistors (MOSFETs) and provide guidelines for a clean representation in datasheets.

1 Scope

This document specifies how to correctly display essential parameters of SiC-based PECS devices having a gate dielectric region biased to turn devices on and off. This typically refers to MOS devices such as MOSFETs and IGBTs. In this document, only NMOS devices are discussed as these are dominant for power device applications; however, the procedures apply to PMOS devices as well. In contrast to silicon power MOSFETs certain aspects of SiC power MOSFETs require a dedicated approach in order to represent device parameters correctly in the datasheet. Details are explained in the following paragraphs, among others the most important topics are:

– substantially higher switching speeds ad high V_{DS};

– strong impact of test setup (see Clause 5);

– impact of body diode as a function of the applied negative gate bias ant the limitations arising for the $V_{G(off)}$ values depending on the actual device.

This document does not define device failure criteria, acceptable use conditions or acceptable lifetime targets. That is up to the device manufacturers and users. However, it provides stress procedures such that the threshold voltage stability over time as affected by gate bias and temperature can be demonstrated and evaluated.

2 Normative references

There are no normative references in this document.

Bibliography

[1] K. Sobe, T. Basler and B. Klobucar, "*Characterization of the parasitic turn-on behavior of discrete CoolSiC MOSFETs*", Proc. PCIM, 2019

[2] JEDEC JEP183, *Guidelines for measuring the threshold voltage (VT) of SiC MOSFETs*

[3] JEDEC JEP184, *Guideline for evaluating Bias Temperature Instability of Silicon Carbide Metal-Oxide-Semiconductor Devices for Power Electronic Conversion*

[4] V. Pala, E. Van Brunt, S. H. Ryu, B. Hull, S. Allen, J. Palmour and A. Hefner, "*Physics of Bipolar, Unipolar and Intermediate Conduction Modes in Silicon Carbide MOSFET Body Diodes*", Proc. ISPSD, 2016, pp. 227-230

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