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Guidelines for Representing Switching Losses of SIC Mosfets in Datasheets

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GUIDELINES FOR REPRESENTING SWITCHING LOSSES OF SIC MOSFETS IN DATASHEETS

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GUIDELINES FOR REPRESENTING SWITCHING LOSSES OF SIC MOSFETS IN DATASHEETS

Foreword

This document was formulated by JEDEC JC-70.2 SiC Power Electronics Conversion Semiconductor Standards subcommittee consisting of worldwide industry experts from various power semiconductor, power supply and test equipment manufacturing companies.

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 SC MOSFET device datasheets.

Introduction

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.

GUIDELINES FOR REPRESENTING SWITCHING LOSSES OF SIC MOSFETS IN DATASHEETS

(From JEDEC Board Ballot JCB-21-53, formulated under the cognizance of the JC-70.2 Subcommittee on SiC Power Electronic Conv. Semiconductor Standards.)

1 Scope

All power semiconductor devices incur switching losses that have to be taken carefully into account when evaluating and benchmarking device performance. For power transistors such as SiC MOSFETs, the losses include turn-on and turn-off losses. In case of SiC diodes, recovery losses also need to be included. In addition, losses originating from the device's internal capacitances need to be considered in application.

This document describes the impact of measurement and/or setup parameters on switching losses of power semiconductor switches; focusing primarily on SiC MOSFET turn-on losses. In terms of turn-off losses, the behavior of SiC MOSFETs is similar to that of existing silicon based power MOSFETs, and as such are adequately represented in typical datasheets. Therefore, the major focus of this representation guide is turn-on losses in SiC MOSFETs. The given methodology can be applied (in datasheets) for single devices, e.g., discrete packages, and parallel operated devices, e.g., power modules. It may also be applied in more complex topologies if topology specific specialties are taken into account.