

JEDEC PUBLICATION

Guidelines for Reverse Recovery Time and Charge Measurement of SiC MOSFET

Version 1.0

JEP201

AUGUST 2024

JEDEC SOLID STATE TECHNOLOGY ASSOCIATION



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GUIDELINES FOR REVERSE RECOVERY TIME AND CHARGE MEASUREMENT OF SiC MOSFET

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Foreword

This document was drafted 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 test methods and circuits to be used for reverse recovery measurements for SiC power conversion devices.

Introduction

In 1994, JEDEC introduced the JESD24-10 standard [1], which describes a test method for measurement of reverse recovery time for power MOSFET drain source diodes. However, this standard proposes a test circuit using a p-channel MOSFET, even though the DUT itself is an n-channel transistor. This makes it difficult to apply this standard to a wide range of SiC power transistors, since p-channel types are not common.

IEC 60747-8 [2] proposes two different test circuits, neither of which requires a p-channel transistor. One of them is the clamped inductive load configuration, as widely used in double pulse test systems. However, when it comes to defining the boundaries for extracting the reverse recovery charge, this standard uses drain leakage current (I_{DSS}) to define the corresponding threshold. This is in the range of micro amperes for power transistors. In contrast, the rated forward current of these transistors is in the tens, if not hundreds, of amperes. The dynamic range of the measurement setup shall cover this entire range. Due to the noise and a limited resolution, it is therefore not possible to determine the crossing of the drain current reliably and repeatedly through such a small threshold.

The objective of this guideline is to overcome the limitations of these standards and provide a test circuit and method that provides both reliable and repeatable results.