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INTERNATIONAL STANDARD

Semiconductor devices – Non-destructive recognition criteria of defects in silicon carbide homoepitaxial wafer for power devices – Part 2: Test method for defects using optical inspection

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CONTENTS

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SEMICONDUCTOR DEVICES – NON-DESTRUCTIVE RECOGNITION CRITERIA OF DEFECTS IN SILICON CARBIDE HOMOEPITAXIAL WAFER FOR POWER DEVICES –

Part 2: Test method for defects using optical inspection

FOREWORD

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International Standard IEC 63068-2 has been prepared by IEC technical committee 47: Semiconductor devices.

The text of this International Standard is based on the following documents:

CDV	Report on voting
47/2475/CDV	47/2522A/RVC

Full information on the voting for the approval of this International Standard can be found in the report on voting indicated in the above table.

This document has been drafted in accordance with the ISO/IEC Directives, Part 2.

A list of all parts in the IEC 63068 series, published under the general title *Semiconductor devices – Non-destructive recognition criteria of defects in silicon carbide homoepitaxial wafer for power devices*, can be found on the IEC website.

The committee has decided that the contents of this document will remain unchanged until the stability date indicated on the IEC website under "http://webstore.iec.ch" in the data related to the specific document. At this date, the document will be

- reconfirmed,
- withdrawn,
- replaced by a revised edition, or
- amended.

A bilingual version of this publication may be issued at a later date.

INTRODUCTION

Silicon carbide (SiC) is widely used as a semiconductor material for next-generation power semiconductor devices. SiC, as compared with silicon (Si), has superior physical properties such as a higher breakdown electric field, higher thermal conductivity, lower thermal generation rate, higher saturated electron drift velocity, and lower intrinsic carrier concentration. These attributes realize SiC-based power semiconductor devices with faster switching speeds, lower losses, higher blocking voltages, and higher temperature operation relative to standard Si-based power semiconductor devices.

SiC-based power semiconductor devices are not fully realized due to some issues including high costs, low yield, and low long-term reliability. In particular, one of the serious issues lies in the defects existing in SiC homoepitaxial wafers. Although efforts of decreasing defects in SiC homoepitaxial wafers are actively implemented, there are a number of defects in commercially available SiC homoepitaxial wafers. Therefore, it is indispensable to establish an international standard regarding the quality assessment of SiC homoepitaxial wafers.

The IEC 63068 series of standards is planned to comprise Part 1, Part 2, and Part 3, as detailed below. This document provides definitions and guidance in use of optical inspection for detecting defects in commercially available silicon carbide (SiC) homoepitaxial wafers.

Part 1: Classification of defects

Part 2: Test method for defects using optical inspection

Part 3: Test method for defects using photoluminescence

SEMICONDUCTOR DEVICES – NON-DESTRUCTIVE RECOGNITION CRITERIA OF DEFECTS IN SILICON CARBIDE HOMOEPITAXIAL WAFER FOR POWER DEVICES –

Part 2: Test method for defects using optical inspection

1 Scope

This part of IEC 63068 provides definitions and guidance in use of optical inspection for detecting as-grown defects in commercially available 4H-SiC (Silicon Carbide) epitaxial wafers. Additionally, this document exemplifies optical images to enable the detection and categorization of the defects for SiC homoepitaxial wafers.

This document deals with a non-destructive test method for the defects so that destructive methods such as preferential etching are out of scope in this document.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

There are no normative references in this document.

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

- IEC Electropedia: available at http://www.electropedia.org/
- ISO Online browsing platform: available at http://www.iso.org/obp

3.1
optical inspection
morphological inspection of wafers using optical imaging where an optical image sensor scans the wafer surface under a non-contact test method for obtaining features of defects, e.g. size and shape of defects

3.2
optical imaging
technique for capturing, processing and analysing images of defects using light source for illumination, optical components, optical image sensor and computer systems

3.3
illumination
application of light to defects and their surroundings so that they can be observed