SLOVENSKI STANDARD
SIST EN 62417:2010

01-september-2010

Polprevodniški elementi - Preskusi z mobilnimi ioni tranzistorjev s kovinskim oksidom na poljski efekt (MOSFET) (IEC 62417:2010)

Semiconductor devices - Mobile ion tests for metal-oxide semiconductor field effect transistors (MOSFETs) (IEC 62417:2010)

Halbleiterbauelemente - Prüfverfahren auf mobile Ionen für Feldeffekttransistoren mit Metall-Oxid-Halbleiter (MOSFET) (IEC 62417:2010)

Dispositifs à semiconducteurs - Essais d'ions mobiles pour transistors à semiconducteur à oxyde métallique à effet de champ (MOSFET) (CEI 62417:2010)

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ICS:

31.080.01	Polprevodniški elementi (naprave) na splošno	Semiconductor devices in general

SIST EN 62417:2010 **en**

EUROPEAN STANDARD

NORME EUROPÉENNE

EUROPÄISCHE NORM

EN 62417

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English version

Semiconductor devices - Mobile ion tests for metal-oxide semiconductor field effect transistors (MOSFETs)

(IEC 62417:2010)

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Europäisches Komitee für Elektrotechnische Normung

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Foreword

The text of document 47/2042/FDIS, future edition 1 of IEC 62417, prepared by IEC TC 47, Semiconductor devices, was submitted to the IEC-CENELEC parallel vote and was approved by CENELEC as EN 62417 on 2010-05-01.

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The following dates were fixed:

– latest date by which the EN has to be implemented at national level by publication of an identical national standard or by endorsement	(dop)	2011-02-01
– latest date by which the national standards conflicting with the EN have to be withdrawn	(dow)	2013-05-01

Endorsement notice

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Semiconductor devices – Mobile ion tests for metal-oxide semiconductor field effect transistors (MOSFETs)

Dispositifs à semiconducteurs – Essais d'ions mobiles pour transistors à semiconducteur à oxyde métallique à effet de champ (MOSFETs)

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SEMICONDUCTOR DEVICES – MOBILE ION TESTS FOR METAL-OXIDE SEMICONDUCTOR FIELD EFFECT TRANSISTORS (MOSFETs)

FOREWORD

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The text of this standard is based on the following documents:

FDIS	Report on voting
47/2042/FDIS	47/2049/RVD

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

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

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

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

SEMICONDUCTOR DEVICES – MOBILE ION TESTS FOR METAL-OXIDE SEMICONDUCTOR FIELD EFFECT TRANSISTORS (MOSFETs)

1 Scope

This present standard provides a wafer level test procedure to determine the amount of positive mobile charge in oxide layers in metal-oxide semiconductor field effect transistors. . It is applicable to both active and parasitic field effect transistors. The mobile charge can cause degradation of microelectronic devices, e.g. by shifting the threshold voltage of MOSFETs or by inversion of the base in bipolar transistors.

2 Abbreviations and letter symbols

This standard uses the following abbreviations and letter symbols:

CV test	capacitance-voltage measurement
HFCV test	high frequency capacitance-voltage measurement
V_g	gate voltage
t_{ox}	oxide thickness
I_{ds}	drain-source current
V_{dd}	positive power supply voltage
$V_{dd,max}$	maximum supply voltage
V_t	transistor threshold voltage
$V_{t,initial}$	the absolute value of the threshold voltage before the test
V_{supply}	the absolute value of the supply voltage
ε_{ox}	dielectric constant of the oxide

3 General description

The stress applied is on test structures at an elevated temperature where mobile ions can overcome the energy barriers at the interfaces and the ion mobility in the oxide is sufficiently high. Two test methods are described in this document.

- Bias temperature stress (BTS)
- Voltage sweep (VS).

The bias temperature stress test is done on transistors. The threshold voltage is determined from an I_{ds} - V_{gs} measurement at room temperature on fresh structures. The threshold voltage is defined as the gate voltage needed to force a fixed drain current through the transistor. Then, a positive gate stress is applied at a high temperature, to sweep the mobile ions towards the substrate. After the stress the test structure is cooled to room temperature with the bias still applied. A second I_{ds} - V_{gs} curve is measured at room temperature. The sequence is completed with a negative gate stress at high temperature followed by an I_{ds} - V_{gs} measurement at room temperature. Mobile charge causes a shift in the I_{ds} - V_{gs} curve. The distance over which the curve is shifted is a measure of the amount of mobile charge in the insulator.