# IEC 62899-203-2

Edition 1.0 2025-06

# INTERNATIONAL STANDARD

**Printed electronics -**
**Part 203-2: Materials - Semiconductor ink - Space charge limited mobility measurement in printed organic semiconductive layers**

ICS 31.180; 87.080

ISBN 978-2-8327-0493-6

IEC 62899-203-2:2025-06(en)

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# Printed electronics - Part 203-2: Materials - Semiconductor ink - Space charge limited mobility measurement in printed organic semiconductive layers

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

| Draft | Report on voting |
|---|---|
| 119/541/FDIS | 119/547/RVD |

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

The language used for the development of this International Standard is English.

This document was drafted in accordance with ISO/IEC Directives, Part 2, and developed in accordance with ISO/IEC Directives, Part 1 and ISO/IEC Directives, IEC Supplement, available at www.iec.ch/members_experts/refdocs. The main document types developed by IEC are described in greater detail at www.iec.ch/publications.

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- reconfirmed,
- withdrawn, or
- revised.

# INTRODUCTION

The IEC 62899-20x series relates mainly to evaluation methods for materials of printed electronics. The series also includes storage methods, packaging and marking, and transportation conditions.

The IEC 62899-20x series is divided into parts according to each material. Each part is prepared as a generic specification containing fundamental information for the area of printed electronics.

The IEC 62899-20x series consists of the following parts:

IEC 62899-201, *Printed electronics – Part 201: Materials – Substrates*

IEC 62899-202, *Printed electronics – Part 202: Materials – Conductive ink*

IEC 62899-203, *Printed electronics – Part 203: Materials – Semiconductor ink*

IEC 62899-204, *Printed electronics – Part 204: Materials – Insulator ink – Measurement methods of properties of insulator inks and printed insulating layers*

Furthermore, sectional specifications, blank detail specifications, and detail specifications of each material will follow these parts.

(Subsequent parts will be prepared for other materials.)

Published literature has demonstrated a significant lack of reproducibility in the determination of value of charge mobility in semiconductive materials when a standardised protocol for testing and data analysis is not used, making benchmarking between semiconducting materials challenging.[1][1]

This document focuses on the determination of charge mobility of semiconductive materials used in printed electronics and contains a standardized protocol for the test conditions, the data analysis method and the reporting procedure.

[1] Numbers in square brackets refer to the Bibliography.

## 1 Scope

This part of IEC 62899 specifies a method to measure the values of effective charge carrier mobility in printed semiconductive layers using space charge limited current (SCLC) mobility technique. The method described is intended to be used as a benchmark test to allow reproducible measurements at a given temperature of the apparent charge carrier mobility for comparison with devices that use different materials, material formulations and fabrication processes for a planar configuration. This document specifies the sample and equipment requirements, and describes the measurement technique, the data analysis procedure and the reporting protocol.

This document is suitable to test unipolar devices (i.e. hole-only or electron-only), where charge injection is efficient and where series resistance does not dominate the current-voltage curve. Therefore, it cannot be used for testing high-electron mobility devices where electron injection can be problematic, for testing highly doped materials where space charge limited current does not exist, or to evaluate mobility in applications that require lateral charge transport, such as in transistors.

## 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.

IEC 62899-203, *Printed electronics – Part 203: Materials – Semiconductor ink*