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Part 503-1: Quality assessment – Test method of displacement current measurement for printed thin-film transistor

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CONTENTS

FOREWORD 3
INTRODUCTION 5
1 Scope 6
2 Normative references 6
3 Terms and definitions 6
4 Abbreviated terms 7
5 Symbols and units 7
6 Measuring method of DCM 8
6.1 Guidelines on measurements of printed TFT channel properties 8
6.2 Procedure for DCM 8
6.2.1 Measuring apparatus 8
6.2.2 Measuring procedure 8
7 Report 10
7.1 Experimental conditions 10
7.2 Appropriate data format 10
Annex A (informative) Experimental results 12
A.1 Charge trapping measurement method 12
A.2 Channel capacitance measurement method 13
Bibliography 15

Figure 1 – Example of structure (left) and schema (right) of a measuring device 8
Figure 2 – Plots of the printed TFT's U_{GS}, I_s, I_D at U_{DS} = −20V with respect to time 9
Figure 3 – Frequency dependence of DCM 10
Figure A.1 – Plot of DCM at U_{DS} = 0 V 13
Figure A.2 – Division of regions according to carrier injection 14

Table 1 – List of symbols 7
Table 2 – Environmental factors 11
Table 3 – Measured properties of the TFT 11
Table A.1 – Obtained trap charge from four cycles (accumulated) 13

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PRINTED ELECTRONICS –

Part 503-1: Quality assessment – Test method of displacement current measurement for printed thin-film transistor

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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 62899 series, published under the general title *Printed electronics*, can be found on the IEC website.

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- reconfirmed,
- withdrawn,
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- amended.

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INTRODUCTION

There has been a need for a method to measure and evaluate performance and reliability that is appropriate for printed thin-film transistors (TFTs). In the case of printed TFTs, there is much larger parasitic capacitance than dielectric capacitance in the channel. Accordingly, there has been a need for a method to measure and evaluate the properties for printed TFTs. Carrier behavior is one such property, and mobility and threshold voltage (V_{th}) for TFTs are other properties. In the case of inorganic TFTs, for example complementary metal-oxide semiconductor (CMOS) TFTs, carriers are induced by the strong inversion at the semiconductor/dielectric interface. But in the case of organic or printed TFTs, carrier generation takes place in the accumulation mode. The total number of carriers in the organic semiconductor layer can often be insufficient to enrich the carrier concentration at the channel. There exists a carrier injection. The carrier injection occurs at the interface of the organic semiconductors' source/drain electrodes. There are three methods to investigate the carrier injection property, that is, Kelvin probe microscopy, four-terminal measurement, and displacement current measurement (DCM). Both Kelvin probe microscopy and four-terminal measurement are indirect methods, but DCM is a direct method to detect charge motion in semiconductors, molecular thin films, and nanoparticles. In this document, the DCM-based channel charge trapping and channel capacitance measurement method is proposed as a measuring method for the carrier properties of organic or printed TFTs.

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1 Scope

This part of IEC 62899 specifies a test method for displacement current measurement (DCM) for printed thin-film transistors (TFTs) or organic thin-film transistors (OTFTs).

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.

ISO 291, *Plastics – Standard atmospheres for conditioning and testing*