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Semiconductor devices – Micro-electromechanical devices – Part 35: Test method of electrical characteristics under bending deformation for flexible electromechanical devices

Dispositifs à semiconducteurs – Dispositifs microélectromécaniques – Partie 35: Méthode d'essai des caractéristiques électriques sous déformation par courbure de dispositifs électromécaniques souples

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SEMICONDUCTOR DEVICES –
MICRO-ELECTROMECHANICAL DEVICES –
Part 35: Test method of electrical characteristics under bending deformation for flexible electromechanical devices

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International Standard IEC 62047-35 has been prepared by subcommittee 47F: Micro-electromechanical devices, of IEC technical committee 47: Semiconductor devices.

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

FDIS	Report on voting
47F/344/FDIS	47F/352/RVD

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.

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INTRODUCTION

In the recent trend toward ubiquitous sensor society and the world of internet of things, demand and thus the market for softer electronic devices are quickly expanding. That is what flexible micro-electromechanical devices are for, some of which are already released into the market. Even a so-called foldable device is under development and will soon appear in the market. However, to operate trillions of such devices for the comfort and safety of human beings, the reliability of the individual devices is a critical concern. Especially in the case of flexible devices, robustness against bending deformation is an important issue which is shared among all the producers and users of such devices. In order to understand how safe a situation is, critical conditions for possible dangers should be thoroughly determined so that the potential risk can be for the first time managed. In this context, flexible devices should be folded in two at least once so that every possible critical failure actually appears. This standard procedure of testing is designed with the emphasis on such a point and with the applicability not only to already emerging flexible devices but also to so-called foldable devices which still function even when the device is folded.

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SEMICONDUCTOR DEVICES – MICRO-ELECTROMECHANICAL DEVICES – Part 35: Test method of electrical characteristics under bending deformation for flexible electromechanical devices

1 Scope

This part of IEC 62047 specifies the test method of electrical characteristics under bending deformation for flexible electromechanical devices. These devices include passive micro components and/or active micro components on the flexible film or embedded in the flexible film. The desired in-plane dimensions of the device for the test method ranges typically from 1 mm to 300 mm and the thickness ranges from 10 μm to 1 mm, but these are not limiting values. The test method is so designed as to bend devices in a quasi-static manner monotonically up to the maximum possible curvature, i.e. until the device is completely folded, so that the entire degradation behaviour of the electric property under bending deformation is obtained. This document is essential to estimate the safety margin under a certain bending deformation and indispensable for reliable design of the product employing these devices.

2 Normative references

There are no normative references in this document.

3 Terms and definitions

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

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

3.1 General

3.1.1
flexible micro-electromechanical system
flexible MEMS
device with structured semiconductor and/or mechanical components electrically connected to each other, being assembled onto or embedded into flexible substrate and operated without unacceptable loss of its functions under bending deformation

EXAMPLE Organic transistors, thermistors, smart diapers with wet sensors and smart epidermal patches for health care, etc.

Note 1 to entry: This note applies to the French language only.

3.2 Loading configurations

3.2.1
bending axis
line on a device around which the device is bent with the minimum radius of curvature

Note 1 to entry: Due to the characteristics of this document, the bending axis can be and should be placed at arbitrary positions in arbitrary directions in accordance with the requirements of the evaluation. The actual positions and directions shall be intentionally determined according to the structures on the test piece.

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