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**NATIONAL STANDARD OF THE
PEOPLE'S REPUBLIC OF CHINA**

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**Micro-electromechanical systems technology - Measurement
methods of electro-mechanical conversion characteristics of
piezoelectric MEMS cantilever**

微机电系统（MEMS）技术 压电微悬臂梁机电转换特性的测试方法
(English Translation)

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Foreword

This document complies with the provisions of GB/T 1.1-2020 "Standardization Work Guidelines Part 1: Structure and Drafting Rules of Standardization Documents".

Drafting.

This document is equivalent to IEC 62047-42:2022 "Semiconductor devices - Microelectromechanical devices - Part 42: Flexible piezoelectric microelectromechanical cantilever".

Measurement method for electromechanical conversion characteristics of beams.

The following minimal editorial changes have been made to this document.

---To align with existing standards, the standard name has been changed to "Mechatronics Conversion Characteristics of Piezoelectric Cantilever Beams in Microelectromechanical

Systems (MEMS) Technology".

Test methods;

---A technical errata is provided for the symbol explanation in formula (4) (see note 2 in 5.2). "The measured $ec_{31,f}(V_{in,max})$ is the minimum value of $ec_{31,f}$, while..." the statement " $ec_{31,f}(V_{in,min})$ is the maximum value of $ec_{31,f}$ " should be changed to "The measured $ec_{31,f}(V_{in,max})$ is the maximum value of $ec_{31,f}$, while $ec_{31,f}(V_{in,min})$ is...".

--- A technical errata was made regarding the reference to the formula (see A.2.4), changing formula (5) to formula (4).

Please note that some content in this document may involve patents. The issuing organization of this document assumes no responsibility for identifying patents.

This document was proposed by the Standardization Administration of China.

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(SAC/TC599) are jointly under the jurisdiction of the State Administration of Taxation.

1 Scope

Microcantilever beams are typical structures for microsensors and microactuators. To obtain practical and accurate piezoelectric thin films with microdevice structures...

The piezoelectric coefficient. This document describes the test method for the electromechanical conversion properties of piezoelectric thin films on microcantilever beams. This document applies to tests conducted using...

Testing of the electromechanical conversion properties of piezoelectric films on microcantilevered structures fabricated using MEMS technology, suitable for consumer, industrial, or any other piezoelectric applications.

2 Normative references

This document has no normative references.

3 Terms and Definitions

The following terms and definitions apply to this document.

A microscale cantilever beam composed of a piezoelectric thin film and a non-piezoelectric material, the non-piezoelectric material being typically a thin silicon layer.

Note: A piezoelectric thin film is deposited on the bottom electrode, followed by the fabrication of a

top electrode on the piezoelectric thin film, and an input voltage is applied between the two electrodes. Platinum is commonly used as a piezoelectric agent.

The top and bottom electrodes of MEMS devices should ideally be thinner than the piezoelectric thin film and non-piezoelectric layer of the microcantilever. In positive piezoelectric measurements, the bottom electrode thickness is measured...

The output signal between the electrode and the sensing top electrode is as described in 5.4.

The transverse piezoelectric coefficient of a piezoelectric film, calculated from the strain or stress caused by an electric field or voltage.

The transverse piezoelectric coefficient of a piezoelectric thin film, calculated from the charge or voltage generated by strain or stress.

4.1 Overview

The method for measuring transverse piezoelectric properties is applicable to monolithic microcantilever beams. The monolithic microcantilever beam specimen of piezoelectric MEMS is shown in Figure 1.