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

GB/T 42709.3-2026

**Semiconductor devices - Micro-electromechanical devices -
Part 3: Thin film standard test piece for tensile testing**

半导体器件 微电子机械器件 第3部分：拉伸试验用薄膜标准试验片

(English Translation)

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Table of Contents

Preface
Introduction
1 Scope
2 Normative References
3 Terms and Definitions
4 Test piece materials
5 Preparation of test pieces
6 Planar shape of the test piece
7 Test piece thickness
8 Measurement Marks
9 Experiment
10 Standard Test Pieces Supplementary Documents
Appendix A (Informative) Test Pieces
A.1 Photolithographic mask for the test piece
A.2 Measurement of test piece thickness
A.3 Number of test pieces used in the experiment.

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 Part 3 of GB/T 42709 "Semiconductor Devices - Microelectromechanical Devices". GB/T 42709 has been published as follows.

Part 2.

---Part 2: Tensile Testing Methods for Thin Film Materials;

---Part 3: Standard test pieces for tensile testing of thin films;

---Part 5: Radio Frequency MEMS Switches;

---Part 7: MEMS Bulk Acoustic Filters and Duplexers for RF Control and Selection;

---Part 19: Electronic Compass.

This document is equivalent to IEC 62047-3:2006 "Semiconductor devices - Microelectromechanical devices - Part 3: Thin films for tensile testing".

"Prepared test piece".

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 Ministry of Industry and Information Technology of the People's Republic of China.

This document is under the jurisdiction of the National Integrated Circuit Standardization Technical Committee (SAC/TC599).

Introduction

This document aims to ensure that the length and width of microelectromechanical systems (MEMS), micromechanical devices, and similar devices are all less than 1 mm, and the thickness is small.

The preparation of standard test pieces for tensile testing of 10 μm thin film structural materials was carried out to ensure the applicability and accuracy of the tests. This also included the preparation of test pieces for...

The test pieces were specified in detail to minimize performance deviations between test pieces.

This document adopts IEC 62047-3:2006, which will enable my country's testing methods in related fields to align with international standards and promote the development of my country's semiconductor industry.

The quality of the components has reached international standards.

GB/T 42709 "Semiconductor Devices and Microelectromechanical Devices" is proposed to consist of 22 parts.

---Part 2: Tensile Testing Methods for Thin Film Materials. The purpose is to specify tensile testing methods for MEMS thin film materials.

---Part 3: Standard Test Pieces for Tensile Testing of Thin Films. The purpose is to specify the test pieces for tensile testing of MEMS thin film materials.

Relevant requirements.

---Part 5: Radio Frequency MEMS Switches. The purpose is to define the terminology, characteristic requirements, and test methods for radio frequency MEMS switches.

Laws, etc.

---Part 6: Axial Fatigue Testing Methods for Thin Film Materials. The purpose is to specify

axial fatigue testing methods for MEMS thin film materials.

method.

---Part 7: MEMS Bulk Acoustic Filters and Duplexers for RF Control and Selection. The purpose is to specify MEMS bulk acoustic filters and duplexers.

Terminology, characteristics, and testing methods for acoustic resonators, filters, and duplexers.

---Part 8: Bending Test Method for Measuring Tensile Properties of Strip Films. The purpose is to specify the methods for measuring the tensile properties of films.

Strip bending test method.

---Part 9: Measurement of inter-wafer bonding strength. The purpose is to specify the testing methods for the bonding strength of MEMS wafers.

---Part 11: Test method for the linear thermal expansion coefficient of materials in suspended microelectromechanical systems. The purpose is to specify the linear thermal expansion coefficient of materials in suspended microelectromechanical systems.

Method for testing the linear thermal expansion coefficient of MEMS materials.

---Part 12: Bending Fatigue Testing Method for Thin Film Materials Using MEMS Structural Resonance. The purpose is to specify the testing methods for MEMS thin film materials.

Methods for testing the flexural fatigue of membrane materials.

---Part 13: Bending and Shear Test Methods for Bond Strength of MEMS Structures. The purpose is to specify the bonding strength of MEMS structures.

Strength test method.

---Part 16: Test methods for residual stress in MEMS films using wafer curvature and cantilever beam deflection. The purpose is to specify the testing methods for MEMS films.

Two test methods were used. residual stress wafer curvature and cantilever beam deflection.

---Part 19: Electronic Compass. The purpose is to define the terminology, characteristics, and testing methods for electronic compasses.

---Part 21: Methods for Measuring Poisson's Ratio of MEMS Thin Film Materials. The purpose is to specify methods for measuring the Poisson's ratio of MEMS thin film materials.

method.

---Part 22: Electromechanical Tensile Testing Methods for Conductive Thin Films on Flexible Substrates. The purpose is to specify the requirements for conductive thin film materials in

MEMS.

Electromechanical property tensile test method.

---Part 26: Description and Measurement Methods for Microgrooves and Needle Structures. The aim is to specify the description and measurement methods for MEMS microgrooves and needle structures.

Description and experimental methods.

---Part 27: Miniature V-T Test (MCT) Method for Measuring Glass Slurry Bond Strength. The purpose is to specify the glass fusion bond strength.

The MCT test method for the bond strength of the structure.

---Part 29: Electromechanical Relaxation Test Methods for Suspended Conductive Thin Films at Room Temperature. The purpose is to specify the electromechanical relaxation test methods for suspended conductive thin films in MEMS devices.

Electromechanical relaxation test method for thin films at room temperature.

---Part 32: Nonlinear Vibration Testing Methods for MEMS Resonators. The purpose is to specify the nonlinear vibration characteristics of MEMS resonators.

Performance testing methods.

---Part 35: Test methods for electrical properties of flexible MEMS devices under bending deformation. The purpose is to specify the electrical properties of flexible electromechanical devices...

Methods for testing electrical properties under bending deformation.

---Part 36: Environmental and Dielectric Permeability Testing Methods for MEMS Piezoelectric Thin Films. The purpose is to specify the environmental and dielectric withstand voltage testing methods for MEMS piezoelectric thin films.

Environmental and dielectric withstand performance test methods.

---Part 38: Test Method for Adhesion Strength of Metal Powder Paste in MEMS Interconnects. The purpose is to specify the adhesion strength of metal powder paste in MEMS interconnects.

This is a test method for the adhesion strength of powders and pastes.

---Part 40: Threshold Test Methods for MEMS Inertial Shock Switches. The purpose is to specify the threshold values for MEMS inertial shock switches.

Test method.

Semiconductor devices and microelectromechanical devices Part 3: Standard test pieces for tensile testing of thin films