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

GB/T 42709.6-2026

**Semiconductor devices - Micro-electromechanical devices -
Part 6: Axial fatigue testing methods of thin film materials**

半导体器件 微电子机械器件 第6部分：薄膜材料轴向疲劳试验方法

(English Translation)

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Table of Contents

Preface	
Introduction	
1 Scope	
2 Normative References	
3 Terms and Definitions	
4 Sample	
4.1 Sample Design	
4.2 Sample Preparation	
4.4 Pre-experiment storage	
5 Test Procedures and Test Machines	
5.1 General Rules	
5.2 Clamping Method (Sample Mounting)	
5.3 Static Load Test	
5.4 Loading Method	
5.5 Test speed	
5.6 Environmental Control	
6 Durability (Test terminated)	
7 Test Report	
Appendix A (Informative) Technical Background of this Document	
A.1 Significance of Axial Fatigue Testing for Thin Film Materials	
A.2 Overview of Cyclic Tests Conducted in Japan	
Appendix B (Informative) Sample	
Appendix C (Informative) Displacement Measurement	
Appendix D (Informative) Test Environment	
Appendix E (Informative) Sample Quantity.	
Reference	

Foreword

Drafting.

This document is Part 6 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 6: Axial fatigue testing methods for thin film materials;
- Part 7: MEMS Bulk Acoustic Filters and Duplexers for RF Control and Selection;
- Part 8: Bending Test Methods for Measuring the Tensile Properties of Strip Films;
- Part 12: Bending fatigue testing method for thin film materials using MEMS structural resonance method;
- Part 19: Electronic Compass;
- Part 21: Methods for Measuring Poisson's Ratio in MEMS Thin Film Materials;
- Part 22: Electromechanical Tensile Testing Methods for Conductive Thin Films on Flexible Substrates;
- Part 29: Electromechanical relaxation test methods for suspended conductive films at room temperature;
- Part 35: Methods for testing the electrical properties of flexible MEMS devices under bending deformation;
- Part 36: Environmental and Dielectric Permeability Testing Methods for MEMS Piezoelectric Thin Films;
- Part 38: Test Method for Adhesion Strength of Metal Powder Paste in MEMS Interconnects;
- Part 40: Threshold testing method for MEMS inertial shock switches.

This document is equivalent to IEC 62047-6:2009 "Semiconductor devices - Microelectromechanical devices - Part 6: Axial fatigue of thin film materials".

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

---Delete "Note. Adapted from ASTM E1823-05a" from sections 3.1, 3.2, and 3.3, and also delete the corresponding references from the bibliography.

Content, and adjust the serial numbers of other documents;

---Change the abbreviation P for force in sections 3.1, 3.2, 3.3, and 3.4 to F;

---In Appendix B, the referenced standard ISO 6892 has been changed to the current standard ISO 6892-1, and the corresponding standard name in the references has been changed;

---Delete the second paragraph in Appendix E. "For metallic thin film materials, fatigue is usually controlled by a single mechanism, and the number of samples can be determined according to..." ISO 12107 defines this. For silicon thin film materials, it is believed that multiple fatigue mechanisms are involved, and the possible fatigue mechanisms have not yet been determined.

Therefore, the analytical methods in ISO 12107 cannot be directly used to determine the number of samples for silicon thin film materials.

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.

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(SAC/TC336) are jointly under the jurisdiction of the State Administration of Taxation.

Introduction

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

---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 and definitions, characteristic requirements, and testing procedures for radio frequency MEMS switches.

Methods, 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 and definitions, characteristic requirements, and test methods for acoustic resonators, filters, and duplexers.

---Part 8: Bending Test Method for Measuring the Tensile Properties of Strip Films. The

purpose is to specify the method for measuring the tensile properties of strip films.

A bending test method for sexuality.

---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 bending 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 wafer curvature and cantilever beam deflection of residual stress in MEMS films. The purpose is to specify the methods for measuring the residual stress in MEMS films.

Two test methods were used. wafer curvature and cantilever beam deflection to measure residual stress in the membrane.

---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 electromechanical tensile testing methods for conductive thin film materials in MEMS.

Electrical property tensile testing method.

---Part 26: Description and Test Methods for Microgrooves and Needle Structures. The purpose is to specify the description and test 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.