

ICS 31.080.99

CCS L 55



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

GB/T 41853-2022

**Semiconductor devices - Micro-electromechanical devices -
Wafer to wafer bonding strength measurement**

Issued on: October 12, 2022

Implemented on: October 12, 2022

**Issued by: State Administration for Market Regulation, China National
Standardization Administration**

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foreword

This document is in accordance with the provisions of GB/T 1.1-2020 "Guidelines for Standardization Work Part 1. Structure and Drafting Rules of Standardization Documents" drafted.

This document is equivalent to IEC 62047-9.2011 "Semiconductor Devices Microelectromechanical Devices Part 9. Inter-wafer bonding of MEMS Strength Measurement".

A chapter "Terms and Definitions" has been added to this document.

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

a) In order to harmonize with existing standards, the name of the standard is changed to "Measurement of bond strength between wafers of MEMS devices for semiconductor devices";

b) Incorporating the amendments of IEC 62047-9.2011/COR1.2012, the outer margin position of the clauses involved is vertical

Double lines (||) are marked;

c) Corrected errors in the original IEC 62047-9.2011. ISO 6892-1.2009 and ASTM E399-06e2 in Chapter 2.

2008 is an informative reference in the text, delete ISO 6892-1.2009 and ASTM E399-06e2.2008; in the bibliography

Added ISO 6892-1.2009 and ASTM E399-06e2.2008;

d) Corrected the error in the original IEC 62047-9.2011. the two-dimensional plots in Figures

5 and 6 do not clearly identify the width of the specimen,

Corrected to a three-dimensional diagram, Figure 6 added the unit label "unit is millimeter".

Please note that some content of this document may be patented. The issuing agency of this document assumes no responsibility for identifying patents.

1 Scope

This document specifies the method for measuring the bond strength after wafer bonding, which is applicable to various wafers such as silicon-silicon eutectic bonding, silicon-glass anodic bonding, etc.

The circular bonding method, and the evaluation of the bonding strength of the relevant structural dimensions in the MEMS process and assembly process.

This document applies to bond strength measurements between wafers from ten microns to several millimeters thick.

2 Normative references

The contents of the following documents constitute essential provisions of this document through normative references in the text. Among them, dated citations

documents, only the version corresponding to that date applies to this document; for undated references, the latest edition (including all amendments) applies to this document.

IEC 60749-19 Mechanical and climatic test methods for semiconductor devices - Part 19. Chip shear strength (Semiconductor

3 Terms and Definitions

There are no terms and definitions that need to be defined in this document.

4.1 General

Bonding strength measurement methods are. visual method, tensile test method, double cantilever beam test method, electrostatic test method, bubble (air tightness) test method, three

Point bending (deformation) test method, and chip shear test method.

4.2.1 Types of visual inspection methods

By observing the color change of the silicon substrate and the glass surface, we can only determine the basic information of whether the two materials are bonded together. should

be used

The test method confirms whether a subsequent bond strength test should be performed, and which area should be selected for testing.

The silicon-glass and glass-glass bonding interfaces should be observed with an optical microscope.

An infrared camera should be used to observe the silicon-silicon bonding interface for voids.

Note. Visual inspection is a qualitative test method.

4.2.2 Equipment

Applicable inspection equipment may use one or more, including. Optical Microscope (OM), Scanning Acoustic Microscope (SAM), Scanning Electron Microscope

Microscope (SEM), Transmission Electron Microscopy (TEM), and Infrared Camera (IR) or Optical Camera (OR).