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Semiconductor devices - Micro-electromechanical devices - Part 9: Wafer to wafer bonding strength measurement for MEMS

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Semiconductor devices - Micro-electromechanical devices - Part 9: Wafer to wafer bonding strength measurement for MEMS (IEC 62047-9:2011)

Dispositifs à semiconducteurs - Dispositifs microélectromécaniques - Partie 9: Mesure de la résistance de collage de deux plaquettes pour les MEMS (CEI 62047-9:2011)

Halbleiterbauelemente - Bauelemente der Mikrosystemtechnik - Teil 9: Prüfverfahren zur Festigkeit von Full-Wafer-Bondverbindungen in der Mikrosystemtechnik (MEMS) (IEC 62047-9:2011)

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Foreword

The text of document 47F/82/FDIS, future edition 1 of IEC 62047-9, prepared by SC 47F, Micro-electromechanical systems, of IEC TC 47, Semiconductor devices, was submitted to the IEC-CENELEC parallel vote and was approved by CENELEC as EN 62047-9 on 2011-08-17.

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The following dates were fixed:

– latest date by which the EN has to be implemented at national level by publication of an identical national standard or by endorsement	(dop)	2012-05-17
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Annex ZA has been added by CENELEC.

Endorsement notice

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In the official version, for Bibliography, the following notes have to be added for the standards indicated:

IEC 62047-2 NOTE Harmonized as EN 62047-2.

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IEC 62047-4 NOTE Harmonized as EN 62047-4.

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Annex ZA
(normative)

Normative references to international publications with their corresponding European publications

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

NOTE When an international publication has been modified by common modifications, indicated by (mod), the relevant EN/HD applies.

Publication	Year	Title	EN/HD	Year
IEC 60749-19	-	Semiconductor devices - Mechanical and climatic test methods - Part 19: Die shear strength	EN 60749-19	-
ISO 6892-1	2009	Metallic materials - Tensile testing - Part 1: Method of test at room temperature	EN ISO 6892-1	2009
ASTM E399-06e2	2008	Standard Test Method for Linear-Elastic Plane-Strain Fracture Toughness K Ic of Metallic Materials	-	-

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Part 9: Wafer to wafer bonding strength measurement for MEMS**

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SEMICONDUCTOR DEVICES –
MICRO-ELECTROMECHANICAL DEVICES –

Part 9: Wafer to wafer bonding strength measurement for MEMS

FOREWORD

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International Standard IEC 62047-9 has been prepared by subcommittee 47F: Micro-electromechanical systems, of IEC technical committee 47: *Semiconductor devices*:

The text of this standard is based on the following documents:

FDIS	Report on voting
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Full information on the voting for the approval of this standard can be found in the report on voting indicated in the above table.

This publication has been drafted in accordance with the ISO/IEC Directives, Part 2.

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The committee has decided that the contents of this publication will remain unchanged until the stability date indicated on the IEC web site under "http://webstore.iec.ch" in the data related to the specific publication. At this date, the publication will be

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SEMICONDUCTOR DEVICES – MICRO-ELECTROMECHANICAL DEVICES –

Part 9: Wafer to wafer bonding strength measurement for MEMS

1 Scope

This standard describes bonding strength measurement method of wafer to wafer bonding, type of bonding process such as silicon to silicon fusion bonding, silicon to glass anodic bonding, etc., and applicable structure size during MEMS processing/assembly. The applicable wafer thickness is in the range of 10 µm to several millimeters.

2 Normative references

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

IEC 60749-19, *Semiconductor devices – Mechanical and climatic test methods – Part 19: Die shear strength*

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ISO 6892-1: 2009, *Metallic materials – Tensile testing – Part1: Method of test at room temperature*

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ASTM E399-06e2: 2008, *Standard Test Method for Linear-Elastic Plane-Strain Fracture Toughness K Ic of Metallic Materials*

3 Measurement methods

3.1 General

There are different ways to measure bonding strength such as visual test, pull test, double cantilever beam test using blade, electrostatic test, blister test, three-point bend test, and die shear test.

3.2 Visual test

3.2.1 Types of visual test

From colour change of silicon substrate and surface of glass, this method tells you only a general information like whether the material is bonded or not. The visual test shall be performed to confirm whether substantial other bonding tests are required, and/or to identify the area that the bonding tests shall be conducted.

Optical microscope shall be used to evaluate the bonding interface of glass to silicon and glass to glass.

An infrared (IR) camera shall be used to observe voids existing in the bonding interface of silicon to silicon

NOTE Visual test is a simple qualitative test method.