



IEC 62047-4

Edition 2.0 2026-01

INTERNATIONAL STANDARD

REDLINE VERSION

**Semiconductor devices - Micro-electromechanical devices -
Part 4: Generic specification for MEMS**

CONTENTS

FOREWORD	3
1 Scope	1
2 Normative references	5
3 Terms, definitions, units and symbols	6
4 Standard environmental conditions	7
5 Marking	7
5.1 Device identification	7
5.2 Device traceability	7
5.3 Packing	7
6 Quality assessment procedures Test schedule	8
6.1 General	8
6.1.1 Overview	8
6.1.2 Eligibility for qualification and for capability approval	8
6.1.3 Primary stage of manufacture	8
6.1.4 Formation of inspection lots	8
6.1.5 Structurally similar device	8
6.1.6 Subcontracting	8
6.1.7 Incorporated components	8
6.1.8 Validity of release	8
6.2 Qualification approval procedure	9
6.2.1 Qualification approval testing	9
6.2.2 Environmental and climatic tests	9
6.2.3 Granting of qualification approval	9
6.2.4 Statistical sampling procedures	11
6.2.5 Endurance tests	11
6.2.6 Endurance tests where the failure rate is specified	12
6.2.7 Accelerated test procedures	13
7 Test and measurement procedures	13
7.1 Standard conditions and general precautions	13
7.1.1 Standard conditions	13
7.1.2 General precautions	13
7.1.3 Precision of measurements	13
7.2 Physical examination	13
7.2.1 Visual examination	13
7.2.2 Dimensions	13
7.3 Climatic and mechanical tests	13
7.4 Alternative test methods	14
Annex A (normative) Sampling procedures	15
A.1 General	15
A.1.1 General	15
A.1.2 Selection of samples	15
A.1.3 Failures	15
A.2 Single-lot sampling method	15
A.2.1 General	15
A.2.2 Sample size	15
A.2.3 Acceptance procedure	15

A.3	Multiple criteria	15
A.4	100 % inspection	15
Annex B (informative)	Classification for MEMS technologies and devices	16
B.1	Manufacturing process technology	16
B.1.1	Basic technology	16
B.1.2	Bulk micromachining technology	16
B.1.3	Surface micromachining technology	16
B.1.4	Assembly and packaging	16
B.1.5	LIGA process	16
B.1.6	Laser micromachining	16
B.1.7	Micro moulding	16
B.1.8	Other	16
B.2	Assembly (interfacing) technology	16
B.3	Applications	16
B.3.1	Bio-medical	16
B.3.2	Communications	17
B.3.3	Consumer electronics	17
B.3.4	Automotive	17
B.3.5	Environmental	17
B.3.6	Defence and space	18
B.3.7	Others	18
B.4	Test and measurement procedures	18
B.4.1	Material properties	18
B.4.2	Device and system characteristics	19
B.4.3	Other	19
Bibliography	20	
Table 1 – MEMS categories and terms	6	
Table 2 – Subgrouping for Group B and Group C	10	

INTERNATIONAL ELECTROTECHNICAL COMMISSION

Semiconductor devices - Micro-electromechanical devices - Part 4: Generic specification for MEMS

FOREWORD

- 1) The International Electrotechnical Commission (IEC) is a worldwide organization for standardization comprising all national electrotechnical committees (IEC National Committees). The object of IEC is to promote international co-operation on all questions concerning standardization in the electrical and electronic fields. To this end and in addition to other activities, IEC publishes International Standards, Technical Specifications, Technical Reports, Publicly Available Specifications (PAS) and Guides (hereafter referred to as "IEC Publication(s)"). Their preparation is entrusted to technical committees; any IEC National Committee interested in the subject dealt with may participate in this preparatory work. International, governmental and non-governmental organizations liaising with the IEC also participate in this preparation. IEC collaborates closely with the International Organization for Standardization (ISO) in accordance with conditions determined by agreement between the two organizations.
- 2) The formal decisions or agreements of IEC on technical matters express, as nearly as possible, an international consensus of opinion on the relevant subjects since each technical committee has representation from all interested IEC National Committees.
- 3) IEC Publications have the form of recommendations for international use and are accepted by IEC National Committees in that sense. While all reasonable efforts are made to ensure that the technical content of IEC Publications is accurate, IEC cannot be held responsible for the way in which they are used or for any misinterpretation by any end user.
- 4) In order to promote international uniformity, IEC National Committees undertake to apply IEC Publications transparently to the maximum extent possible in their national and regional publications. Any divergence between any IEC Publication and the corresponding national or regional publication shall be clearly indicated in the latter.
- 5) IEC itself does not provide any attestation of conformity. Independent certification bodies provide conformity assessment services and, in some areas, access to IEC marks of conformity. IEC is not responsible for any services carried out by independent certification bodies.
- 6) All users should ensure that they have the latest edition of this publication.
- 7) No liability shall attach to IEC or its directors, employees, servants or agents including individual experts and members of its technical committees and IEC National Committees for any personal injury, property damage or other damage of any nature whatsoever, whether direct or indirect, or for costs (including legal fees) and expenses arising out of the publication, use of, or reliance upon, this IEC Publication or any other IEC Publications.
- 8) Attention is drawn to the Normative references cited in this publication. Use of the referenced publications is indispensable for the correct application of this publication.
- 9) IEC draws attention to the possibility that the implementation of this document may involve the use of (a) patent(s). IEC takes no position concerning the evidence, validity or applicability of any claimed patent rights in respect thereof. As of the date of publication of this document, IEC had not received notice of (a) patent(s), which may be required to implement this document. However, implementers are cautioned that this may not represent the latest information, which may be obtained from the patent database available at <https://patents.iec.ch>. IEC shall not be held responsible for identifying any or all such patent rights.

This redline version of the official IEC Standard allows the user to identify the changes made to the previous edition IEC 62047-4:2008. A vertical bar appears in the margin wherever a change has been made. Additions are in green text, deletions are in strikethrough red text.

IEC 62047-4 has been prepared by subcommittee 47F: Micro-electromechanical systems, of IEC technical committee 47: Semiconductor devices. It is an International Standard.

This second edition cancels and replaces the first edition published in 2008. This edition constitutes a technical revision.

This edition includes the following significant technical changes with respect to the previous edition:

- a) in the Scope, optical MEMS, bio-MEMS, micro TAS, and power MEMS for various types of MEMS applications were included;
- b) MEMS categories and terms in Table 1 were slightly modified such consumer electronics and automotive were added that in application technology.

The text of this International Standard is based on the following documents:

Draft	Report on voting
47F/532/FDIS	47F/540/RVD

Full information on the voting for its approval can be found in the report on voting indicated in the above table.

The language used for the development of this International Standard is English.

A list of all parts in the IEC 62047 series, published under the general title *Semiconductor devices - Micro-electromechanical devices*, can be found on the IEC website.

This document was drafted in accordance with ISO/IEC Directives, Part 2, and developed in accordance with ISO/IEC Directives, Part 1 and ISO/IEC Directives, IEC Supplement, available at www.iec.ch/members_experts/refdocs. The main document types developed by IEC are described in greater detail at www.iec.ch/publications.

The committee has decided that the contents of this document will remain unchanged until the stability date indicated on the IEC website under webstore.iec.ch in the data related to the specific document. At this date, the document will be

- reconfirmed,
- withdrawn, or
- revised.

1 Scope

This part of IEC 62047 describes generic specifications for micro-electromechanical systems (MEMS) made by semiconductors, which are the basis for specifications given in other parts of this series for various types of MEMS applications such as sensors, RF MEMS, ~~excluding~~ optical MEMS, bio-MEMS, micro TAS, and power MEMS. This document specifies general procedures for quality assessment ~~to be used in IECQ-CECC systems~~ and establishes general principles for describing and testing of electrical, optical, mechanical and environmental characteristics.

This part of IEC 62047 aids in the preparation of standards that define devices and systems made by micromachining technology, including but not limited to, material characterization and handling, assembly and testing, process control and measuring methods. MEMS described in this document are basically made of semiconductor material. However, the statements made in this document are also applicable to MEMS using materials other than semiconductor, for example, polymers, glass, metals and ceramic materials.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements 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 60027 (all parts), *Letter symbols to be used in electrical technology*

IEC 60050-523, *International Electrotechnical Vocabulary (IEV) - Part 523: Micro-electromechanical devices* (available at www.electropedia.org)

IEC 60068-2 (all parts), *Environmental testing - Part 2: Tests*

IEC 60617, *Graphical symbols for diagrams*

~~IEC 60747-1:2006, Semiconductor devices - Part 1: General~~

~~IEC 60749 (all parts), Semiconductor devices - Mechanical and climatic test methods~~

IEC 61193-2, *Quality assessment systems - Part 2: Selection and use of sampling plans for inspection of electronic components and packages*

IEC 62047-1, *Semiconductor devices - Micro-electromechanical devices - Part 1: Terms and definitions*

~~IEC QC 001002-3:2005, IEC Quality Assessment System for Electronic Components (IECQ) - Rules of Procedure - Part 3: Approval procedures~~

~~ISO 1000, SI units and recommendations for the use of their multiples and of certain other units~~

ISO 2859-1:1999, *Sampling procedures for inspection by attributes - Part 1: Sampling schemes indexed by acceptance quality limit (AQL) for lot-by-lot inspection*

ISO 2859-1:1999/AMD1:2011

ISO 80000-1, *Quantities and units - Part 1: General*