

# TECHNICAL SPECIFICATION

---

**Piezoelectric, dielectric and electrostatic devices and associated materials for frequency control, selection and detection – Glossary –  
Part 4-4: Piezoelectric materials – Single crystal wafers for surface acoustic wave (SAW) devices**

INTERNATIONAL  
ELECTROTECHNICAL  
COMMISSION

---

ICS 01.040.31; 31.140

ISBN 978-2-8322-6178-1

**Warning! Make sure that you obtained this publication from an authorized distributor.**

## CONTENTS

FOREWORD.....	3
1 Scope.....	5
2 Normative references .....	5
3 There are no normative references in this document.Terms and definitions .....	5
3.1 Single crystals for SAW wafer .....	5
3.2 Terms and definitions related to LN and LT crystals.....	6
3.3 Terms and definitions related to all crystals .....	7
3.4 Flatness.....	7
3.5 Definitions of appearance defects .....	10
3.6 Other terms and definitions .....	11
Bibliography.....	14
Figure 1 – Example of site distribution for LTV measurement.....	7
Figure 2 – LTV value of each site.....	8
Figure 3 – Schematic diagram of Sori .....	9
Figure 4 – Wafer sketch and measurement points for TV5 determination .....	9
Figure 5 – Schematic diagram of TTV .....	10
Figure 6 – Schematic diagram of warp .....	10
Table 1 – Description of wafer orientations .....	12

## INTERNATIONAL ELECTROTECHNICAL COMMISSION

**PIEZOELECTRIC, DIELECTRIC AND ELECTROSTATIC DEVICES  
AND ASSOCIATED MATERIALS FOR FREQUENCY CONTROL, SELECTION  
AND DETECTION – GLOSSARY –****Part 4-4: Piezoelectric materials – Single crystal wafers  
for surface acoustic wave (SAW) devices**

## 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) Attention is drawn to the possibility that some of the elements of this IEC Publication may be the subject of patent rights. IEC shall not be held responsible for identifying any or all such patent rights.

The main task of IEC technical committees is to prepare International Standards. In exceptional circumstances, a technical committee may propose the publication of a technical specification when

- the required support cannot be obtained for the publication of an International Standard, despite repeated efforts, or
- the subject is still under technical development or where, for any other reason, there is the future but no immediate possibility of an agreement on an International Standard.

Technical specifications are subject to review within three years of publication to decide whether they can be transformed into International Standards.

IEC TS 61944-4-4, which is a technical specification, has been prepared by IEC technical committee 49: Piezoelectric, dielectric and electrostatic devices and associated materials for frequency control, selection and detection.

This third edition of IEC 61994-4-4 cancels and replaces the second edition published in 2010. This edition constitutes a technical revision.

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

- a) the new terms and definitions given in IEC 62276:2016 have been taken into account;
- b) the general title has been changed according to the change in the title of TC 49 in 2009.
- c) the part title has been changed according to the title of IEC 62276:2016.

The text of this technical specification is based on the following documents:

Enquiry draft	Report on voting
49/1283/DTS	49/1287/RVC

Full information on the voting for the approval of this technical specification can be found in the report on voting indicated in the above table.

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

A list of all parts in the IEC 61994 series, published under the general title *Piezoelectric, dielectric and electrostatic devices and associated materials for frequency control, selection and detection – Glossary*, can be found on the IEC website.

Future standards in this series will carry the new general title as cited above. Titles of existing standards in this series will be updated at the time of the next edition.

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

- reconfirmed,
- withdrawn,
- replaced by a revised edition, or
- amended.

A bilingual version of this publication may be issued at a later date.

**PIEZOELECTRIC, DIELECTRIC AND ELECTROSTATIC DEVICES  
AND ASSOCIATED MATERIALS FOR FREQUENCY CONTROL, SELECTION  
AND DETECTION – GLOSSARY –**

**Part 4-4: Piezoelectric materials – Single crystal wafers  
for surface acoustic wave (SAW) devices**

## **1 Scope**

This part of IEC 61994 gives the terms and definition for single crystal wafers for surface acoustic wave (SAW) devices representing the state of the art.

## **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.

There are no normative references in this document.